JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA

FOR THE

PROMOTION OF THE MECHANIC ARTS.

JULY, 1855.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Description of a Dredging Machine Invented and Patented by D. S. Howard, *of Lewis County, N. Y., with some Notes made at a trial of it at Whitehall, Washington County, N. Y.; accompanied by some formulæ and rules for calculating the effect of Dredging Machinery.* By John W. Nystrom.

The dredging machinery represented in the accompanying plates, is worked by a pair of horizontal high pressure steam engines.

Plate I. represents a side elevation of the machine, showing the buckets drawn up on one side to the full height above the water line, and those on the other side let down to the full depth of excavation.

Plate II. is an end view of the same, showing the buckets down on the starboard side, and up on the port side above the water line.

Plate III. is a plan of the dredge, showing the steam engines and the method of transmitting the motion from them to the dredging machinery.

The power from the steam engine is transmitted through the main shaft *e*, and chain wheel *s*, over which is placed the joint chain I, passing over a second chain wheel *l*, by which the motion is transmitted to the pinion H, and cog-wheel J. The bucket chain *t*, passes over a pair of chain wheels fitted on the same shaft with the cog-wheel J, by which, motion is given to the buckets.

The two engines are connected by a link *r*, so that the cranks G G, are at right angles. The dredging machinery is the same on each side of the boat.

The driving chain I, and bucket chain *t*, are composed of alternate links of wrought and cast iron riveted together by steel bolts, so that the pitch of the chain is equal to the pitch of the studs on the chain wheels,

which studs fit into the *wrought* iron links of the chain. The buckets and bucket chain pass from the driving chain wheels K K, over a pair of flanch wheels M M, situated on a car movable on the inclined plane X; the buckets and bucket chain then pass down to the place of excavation, under another pair of chain wheels Q, where the buckets dig their loads, and are drawn up by the driving chain wheels K K, over which the buckets with their excavated material pass to the place where it is unloaded.

The buckets have the side nearest to the chain made like a door, latched to the bucket, when full; on the chain wheel shaft K K, is a latch wheel which unlatches the door, and the excavated material, of its own weight, falls into the spout N, and passes off into a scow placed underneath for the purpose, while the empty bucket, with its door open, continues its motion over the flanch wheel M M, where the door is closed by the wheel P, and the bucket goes down for another load.

The lower chain wheel under which the buckets excavate are supported by a wooden framing called ways. Those ways are guided by friction rollers at the top, and by the rack arm S, at the lower end. The buckets and ways are raised or lowered by moving the car U, up or down on the inclined plane X, which motion is either operated by hand or steam power. For hand, the windlass *u* is worked by the crank T, pinion and wheel V; when worked by steam power, the pinion is thrown into gear with both the wheels U and V, the wheel U, which is fast on the flanch wheel shaft, transmits the motion through the pinion to the wheel V, and windlass *u*, by which the car is wound up or lowered on the inclined plane X, and the buckets with the ways are raised or lowered to suit the depth of excavation, or can be raised up above the water line when required.

The dredge can be fed (moved ahead) in three different manners while excavating. *First*, by a kedge anchor placed at a suitable distance ahead of the dredge; in this anchor is fastened the hemp cable *g*, extended to and wound up on the windlass *f*, which is worked either by hand, by the crank *v* and pinion *w*, or by steam power working the pall *y* in the cog-wheel *w*. The pall receives its motion from the eccentric and lever *x*. This is the most general mode of feeding the dredge when long distances are to be excavated. For short distances, the feeding is done (*secondly*) by the rack arm S, which receives its motion from the crank *c*, connecting rod *d*, and lever *b*, on which latter is a double pall working into the wheel *a*, and by a pinion gearing into the rack arm S; the ways R, with the lower chain wheel Q, can be pushed forward, while the dredge boat is at anchor; and, *thirdly*, the dredge can be fed by the ropes *b' b'*, attached to the bow and stern anchors *h h*.

The bow and stern anchors *h h*, are secured sideways above the deck of the boat and at the lower guards, but are allowed to move at the bottom fore and aft about fifteen feet, which allows the dredge to move that distance towards the kedge anchor by feeding in the cable *g*, and the dredge will be confined in a lateral direction, as the anchors are guided sideways.

The anchors *h h*, are raised either by a hand lever or by steam power, the ropes *o o*, passing round pulleys to bring them in a right direction for the capstans *p p*, by which the anchors are raised.

United States Dredge Machine at Whitehall, N. Y.

In March, 1853, the Bureau of Topographical Engineers contracted with Mr. Howard for the construction of four dredge boats for service in Lakes Champlain, Ontario, Erie, and Michigan.

These boats, in addition to the dredging machine, were required to be provided with locomotive power, in order that they might be transferred from harbor to harbor, as the necessity of the service might require.

The one for Lake Champlain was prepared for inspection and delivery by November, 1853, and the Bureau assigned this duty to Lieut. George G. Meade of the Corps of Topographical Engineers.

This officer has furnished a report of the performance of the dredge under inspection to the Bureau.

The following is a summary of my notes made under the same inspection.

Dimensions of the Dredge Boat.

Length in clear,		123 feet.
Length from centre of rudder to outer side of stem,		109 " 6 inches.
Breadth of beam,		26 " 1 "
" " over all,		41 " 1 "
Draft of water forward,		2 " 7 "
" " aft,		3 " 1 "
Mean draft,		2 " 10 "
Greatest immersed section,		68 square feet.
Tonnage of displacement,	141 tons.	
" Custom house measurement,	157 "	

Two horizontal high pressure engines.

Diameter of cylinders,	12¼ inches.
Stroke of piston,	4 feet.

Two cylindrical boilers placed side by side half surrounded by brickwork forming the first flues.

Length of boilers,	20 feet 3 inches.
Outside diameter,	3 " 4½ "
Two flues in each boiler. Inside diameter,	14⅝ "
Total heating surface in both boilers,	617 square feet.
" fire grate " "	37 " "
Area of draft to fire grate,	6 " "

The boat was provided with paddle wheels to move her from place to place, the paddle wheel shaft being connected to the main shaft by couplings, so that the wheels could be worked together or separately.

Extreme diameter of paddle wheels,	15 feet.
Number of floats in each, 14.	
Each float 5 feet wide by 15 inches deep,	= 6·25 square feet.

Dredging Machinery.

There are two sets of buckets, one on each side of the boat, as represented on the accompanying plates. The buckets are connected by two chains of alternate wrought and cast iron links; the wrought iron links are 8 inches between the centres, by ½-inch thick, forming the space for the studs on the chain wheels, while the cast iron links are 6 inches between the centres, by 2½ inches thick, fitting between the studs. The wrought iron links are riveted, one on each side, by steel pins, to the ends of the cast iron links, making the pitch of the chain $8+6=14$ inches, and five pitches $=5$ feet 10 inches between each bucket.

The buckets are made of ¼-inch boiler iron, 2 feet 6 inches by 1 foot 3 inches at the top and 2 feet deep, making the capacity of each bucket 6¼ cubic feet.

The following TABLE contains the result of a day's work of the dredging machine in South Bay, Whitehall, New York, November 12, 1853.

No. of operations.	Time by watch. Commenced.	Stopped.	Operating time in minutes. Excavating.	Emptying scows.	Total.	Cubic yards per Operation.	Minute.	Depth in feet of Excavating.	Water.	Excavated channel.	Feeded feet per Operation.	Minute.	Steam Engine. Revolutions.	Steam.	Horse power.	Excavated materials in tons per hour.	Remarks.
	H. M	H. M.												lbs.			
1	9 20	9 35	15	4	19	40	2·85	11	8	3	70	4·65	38	30	21·6	139	Soft clay.
2	9 39	9 53	14	3	17	35	2·50	11	8	3	51	3·64	37	20	14·7	122	Do.
3	9 56	0 10	14	4	18	42	3·00	11	7 9	3 3	76	5·42	40	25	20·	146	Do.
4	10 14	10 27	13	4	17	42	3·23	11	7 9	3 3	60	4·61	40	25	20·	158	Do.
5	10 31	10 46	15	3	18	42	2.80	11	7 6	3 6	56	3·73	37	25	18·5	137	Do. softer.
6	10 49	11 02	13	2	15	44	3·38	11	7 6	3 6	53	4·07	38	20	15·2	155	Do. and vegetable matter.
7	11 04	11 17	13	3	16	47	3·61	11	7 3	3 9	52	4·00	39	20	15·6	166	Mud and very soft.
8	11 20	11 35	15	3	18	41	2·73	11	7 3	3 9	42	2·80	40	25	20·	125	
			1 h. 52 m.	36	2 h. 18 m	333	2·97				460	4·10					Shifted the boat for a new start 30 min. Dinner 1 h.
	H. M.	H. M.	M.											lbs.			The two scows on one side.
9	1 06	1 19	11	2	13	44	4·00	11	8	3	50	4·53	48	25	24·	195	Common clay.
10	1 18	1 27	9	2	11	44	4·87	11	8	3	56	6·20	47	25	23·5	238	Do.
11	1 29	1 40	11	1	12	32	4·91	11	7 9	3 3	66	6·00	48	30	28·8	142	Some hard clay mixed with vegetable matter.
12	1 41	1 50	9	2	11	44	4·88	11	7 9	3 3	78	8·64	50	35	35·	237	
13	1 52	2 04	12	1	13	44	3,67	11	7 6	3 6	80	6·65	48	30	28·8	179	Found a log; raised up the buckets on one side, Clay and vegetable matter.
14	2 05	2 15	10	1	11	42	4·20	11	7 6	3 6	81	8·10	47	30	28·1	204	
15	2 16	2 28	12	2	14	42	3·50	10, 11,	7 3	3 9	66	5·50	44	40	35·2	165	
16	2 30	2 41	11	2	13	46	4·17	11	7 3	3 9	57	5·17	44	30	26·4	197	A crooked log about 3 feet long by 7 inches diameter came up in a bucket.
17	2 43	2 55	12	1	13	44	3·66	9, 10, 11,	7	4	50	4·16	40	30	24·	173	
18	2 56	3 15	19	2	21	46	2·42	11	7	4	67	3·52	38	30	22·8	114	
			1 h. 56 m.	16	2 h. 12 m.	428	3·68				651	5·60					Raised up the buckets on one side.
	H. M.	H. M.												lbs.			Shifted the boat for a new start.
19	3 57	4 08	11	1	12	46	4·18	11	8	3	60	5·45	39	25	19·5	203	Soft clay.
20	4 09	4 22	13	2	15	44	3·38	11	8	3	70	5·37	38	20	15·2	165	Do.
21	4 24	4 37	15	2	17	44	2·93	11	7 9	3 3	72	4·80	40	25	20.	143	Some harder clay.
22	4 39	4 50	11	1	12	46	4·18	10	7 9	3 3	69	6·26	46	25	23·	203	Do.
23	4 51	5 00	9	1	10	44	4·88	11	7 6	3 6	64	7·10	46	25	23·	238	Do.
24	5 01	5 15	14	5	19	44	3·14	11	7 6	3 6	84	6·00	47	25	21·5	153	
25	5 20	5 33	13	3	16	46	3 53	11	7 3	3 9	54	4·15	40	20	16·	172	
			1 26	15	1 41	314	3·65				473	5·50		Steam valve only ¼ open.			
			1 56	16	2 12	428	3·68				651	5·60					
			1 52	26	2 18	333	2·97				460	4·10					
Averages.			5 14	57	6 11	1075	3·42				1584	5·04	42		22	170	

In the first eight operations, two scows were used, one on each side of the dredge, to receive the excavated materials, and for each operation received the cubic yards noted in the 7th column. In the fifth column is noted the time occupied in moving and emptying the scows and replacing them for the next operation. The dredge is provided with four scows capable of carrying forty tons each, of which we had only two at South Bay. In order to occupy as little time as possible in conveying the excavated material away, both the scows were placed on the port side of the dredge, so that one could be emptied while the other one was being filled, and the excavated material on the starboard side was dropped into the Bay, supposing it to be the same quantity as on the port side, where it was measured by the scows, and its specific gravity noted.

Lieutenant Meade considered this day's work to have been a satisfactory test, and that the dredging machinery was capable of doing more than double the duty that the contract called for. The locomotive power of the boat still remained to be tried.

The locomotive power of the dredge boat was tested on Lake Champlain, November 16th, 1853. Started from Benson at 7 o'clock in the morning against a brisk wind, current about one-quarter of a mile an hour in our favor. Arrived at Barber's Point at 2 hours 7 minutes P. M., a distance from Benson of 39 miles. From Barber's Point we returned to Benson, where we arrived at 7 h. 56 m. the same evening.

The whole time from Benson to Barber's Point and back was	12 h. 56 m.
Of which time the engine was stopped, . .	0 54
Actual running time, . . .	12 h. 2 m.

A distance of 78 miles, making nearly 6½ miles per hour.

The average pressure in the boilers was 100 lbs. per square inch. Cut off at half stroke. Paddle wheels made 20 revolutions per minute.

Diameter of the centre of pressure of the floats in the paddle wheels,	=13·75 feet.
Circumference of the same, . . .	=43·19 "

Distance moved through by centre of pressure $\frac{20\times43\cdot19\times722}{5280}=118\cdot1$ miles nearly.

$$\text{Slip of paddles } \frac{78}{118}=66\cdot04 \quad 100-66\cdot04=33\cdot96.$$

Slip = 34 per cent. nearly.

Formulæ and Rules for Dredging Machinery.

The following formulæ and rules were deduced by me from the performances of a number of dredging machines built in Motala, Sweden, some of which have since been published in my Pocket Book of Mechanics and Engineering.

Letters Denote

T. = tons of materials excavated per hour.

h. = height in feet, to which the excavated material is raised above the bottom of the excavated channel.

H. = horse power required to excavate T. tons of material per hour.

k. = coefficient for the different kinds of materials, which have been found by actual performance.

Very hard clay mixed with gravel, .	k = 0·1
Hard pure clay, .	k = 0·07
Common clay or sand, .	k = 0·05
Soft clay or loose sand, .	k = 0·04
Very soft and loose sand, .	k = 0·03

$$H = T\left(\frac{h}{700} + k\right) \quad - \quad - \quad - \quad - \quad 1$$

This is the formula for finding the horse power required to excavate T. tons of material per hour, and raise it to feet.

Example 1.—A harbor of hard pure clay is to be excavated to 15 feet of water, the material to be raised 11 feet above the water line, making the height h = 15 + 11 = 26 feet; it is desired to raise T = 250 tons of clay per hour. Required the horse power necessary for the excavation?

$$H = 250\left(\frac{26}{700} + 0{\cdot}07\right) = 26{\cdot}785 \text{ Horses.}$$

Given the horse power, to find the quantity of materials that can be excavated per hour.

$$T = \frac{700\ H}{h + 700\ k} \quad - \quad - \quad - \quad - \quad - \quad 2$$

Example 2.—A steam engine of 20 horses is to be used for a dredging machine to excavate a dock of common clay to 10 feet, the material is to be raised 9 feet above water line, making the height h = 10 + 9 = 19 feet. Required how many tons of clay can be excavated and raised per hour, T = ?

$$T = \frac{700 \times 20}{19 + 700 \times 0.05} = 259 \text{ tons.}$$

To find the power necessary to loosen the material without raising it. This will be found by the insertion of the height, h = o in the formula 1, and will appear simply—

$$H = Tk \quad - \quad - \quad - \quad - \quad - \quad 3$$

Example 3.—What power is required to dig loose, T = 300 tons of soft clay per hour, H = ?

$$H = 300 \times 0{\cdot}04 = 12 \text{ Horses.}$$

Example 4.—How many tons (T) of hard pure clay can be dug loose per hour by an engine of H = 18 horses, T = ?

$$T = \frac{18}{0{\cdot}07} = 257 \text{ tons.}$$

To find the resistance opposed to feeding the dredge by excavation. Let v = velocity of the buckets in feet per second, and

F = the force in pounds resisting the feed motion of the dredge, we shall have the force—

$$F = \frac{550\ H}{v} = \frac{550\ T\ k}{v} \quad - \quad - \quad - \quad 4, 5$$

Example 5.—A dredging machine is to excavate, T = 160 tons of very hard clay per hour, and the velocity of the buckets v = 0·89 feet per second. Required the force necessary to feed the dredge ahead, F = ?

$$F = \frac{550 \times 150 \times 0{\cdot}1}{0{\cdot}89} = 8269 \text{ pounds.}$$

If only one kedge anchor and cable is used for feeding the dredge ahead, the circumference of the cable should be

$$\text{Circumference} = \sqrt{\frac{9269}{120}} = 8{\cdot}78 \text{ inches, or } 2\tfrac{3}{4} \text{ inches in diameter.}$$

THE SAME LETTERS ON THE DRAWINGS REFER TO LIKE PARTS.

A, Steam boiler.
B, Safety valve.
C, Steam pipe.
D, Exhaust pipe.
E, Steam cylinder.
F, Connecting rod.
G, Crank.
H, Driving pinion.
I, Driving chain.
J, Driving wheel.
K, Dri'g chain wheel.
L, Buckets.
M, Flanch wheel.
N, Spout.
O, Latch wheel.
P, Door shut wheel.
Q, Low. ch'n wheels.
R, Ways.
S, Rack arm.
T, Crank.
U, Cog w'l } windlass
V, Cog w'l }
W, Chimney.
X, Inclined plane.
Y, Balance weight.
Z, Lever joint.

a, Spur wheel.
b, Pawl arm.
c, Crank.
d, Feed con'ing rod.
e, Main shaft.
f, Driving shaft,
g, Cab. for ked'e an.
h, Anchor.
i, Lever.
j, Driving wheel.
k, Block & sheeves.
l, Chain wheel.
m, Sheeves.
n, Anch. hoistings,
o, Anchor rope.
p, Capstan.
q, Anchor.
r, Connecting link.
s, Chain wheel.
t, Bucket chain.
u, Car windlass.
v, Feed motion cra'k
w, Pinion.
x, Eccentric.
y, Pawl, feed motion.
z, Hatch.

AMERICAN PATENTS.

List of American Patents which issued from May 1, *to May* 29, 1855, (*inclusive,*) *with Exemplifications.*

MAY 1.

1. For an *Improved Ticket Register for Railroad Cars;* William Apperly, Louisville, Kentucky.

Claim.—"1st, The improvement for distributing and registering railroad and other tickets, consisting in the combination and arrangement of the slide, spring, and register device, or its equivalent. 2d, Providing the extension and inclined way."

2. For an *Improved Fire Engine;* John R. Adams, Port Jervis, N. Y.

Claim.—"Having the cylinders placed radially in a band or ring, and encompassing said band or ring with a band or ring and cam, the band or ring and cam being allowed to rotate around the band or ring and cylinders, and operating the pistons of the cylinders, in consequence of their connexion with the cam."

3. For an *Improved Bullet Mould;* William Ashton, Middletown, Connecticut.

Claim.—"Having a conical aperture, made in a piece of metal, and having a projection or cone, and flanch, attached to a metal strip, which is secured to the shank handle of the mould by a pivot, so that said projection or cone, may be inserted in and withdrawn from the aperture."

4. For an *Improved Clothes-Pin Machine;* H. and M. Blake, Hartland, Vermont.

Claim.—"1st, The employment or use of the holding cylinder and circular saw, when both are hung on permanent shafts, so that the cylinder rotates with a comparatively slow motion, compared with the saw, and conveys by a continuous rotary motion the clothes pins over against the saw, for the purpose of forming the grooves or slots therein. 2d, Securing the clothes pins in the holders of the cylinder by means of the clamps secured to the periphery of the cylinder, and operated by the rim or ledge and flanch,

so that the clothes pins will be firmly clutched in the holders, while being operated upon by the saw and cutters, and allowed to fall therefrom when the grooves or slots are finished. 3d, The combination of the cylinder, saw, and cutters."

5. For an *Improvement in Wheelwrights' Boring and Tenoning Machine;* Chauncey Cowdry, Orrin Tolls, and Chauncey C. Tolls, Ithaca, New York.

Claim.—"1st, The combination and arrangement of the frame with the scale of graduated and sliding tubes and screw. 2d, The combination of the hinged support with the sliding screw clamp. 3d, The combined arrangement of the several parts."

6. For an *Improvement in Processes for Purifying and Cleansing Wheat;* Charles Campbell, California.

Claim.—"The preparation of lime for this particular purpose, and the application of it to wheat, when new slaked and warm, so as to much more effectually cleanse the wheat from all impurities than by any other process."

7. For an *Improved Machine for Bundling Fleeces of Wool;* John How, Deer Creek, Michigan.

Claim.—"In combination with the packing box, the adjustable straps, with their piece, and the levers, for pressing the bale, and furnished in a convenient position for the operator, the strings or cords by which the pressed fleeces are baled up."

8. For an *Improved Mode of Applying Eccentric Wheel to Water Power;* James B. Hurt, Nottoway County, Virginia.

Claim.—"The water wheel without arms or main shaft revolving on fulcrum wheels underneath, thereby lengthening out the lever power near the whole diameter of the wheel, the thick and thin interties shouldered and bolted to each rim, the cast segments bolted to middle rim, which gears into the cogs of wollower on horizontal shaft extending across on the inside of water wheel; also the two revolving fulcrum wheels, with flanches on the outside of each wheel, to keep the water wheel in its true position."

9. For an *Improvement in Shuttles for Looms;* Laroy Litchfield, Southbridge, Mass.

Claim.—"The backward extension of the heel of the spindle combined with the application of the spring above the said heel, and above and in rear of the pin, on which the spindle moves in such manner as to hold the spindle in its operative position, by throwing its heel upwards against a proper fixed bearing."

10. For an *Improvement in Shuttles for Looms;* Ezra P. Marble, New Worcester, Massachusetts.

Claim.—"Attaching the catch, which confines the bobbin or cop on the spindle to a pin, which works perpendicularly through the spindle, and is acted upon for the purpose of throwing, and holding the catch in operation by a spiral spring or its equivalent, and acted upon for the purpose of throwing the catch out of operation by coming in contact as the spindle is raised with a plate, or other fixed stop."

11. For an *Improvement in Horse Powers;* Clement Russell, Massillon, Ohio.

Claim.—"Providing a broad solid flanched box or centre for the axis to rest in, when said box is made in two parts, and fitted and confined by the axis itself, and flanches in an oblong slot formed in a bridge."

12. For an *Improvement in Corn Planters;* Presley Raines, London, Ohio.

Claim.—"The combination of elevator, sliding platform, and flaring plunger, operated simultaneously by the elevation and depression of the guiding handles."

13. For an *Improvement in Alarm Attachment for Door Locks;* John Schneider, Rochester, New York.

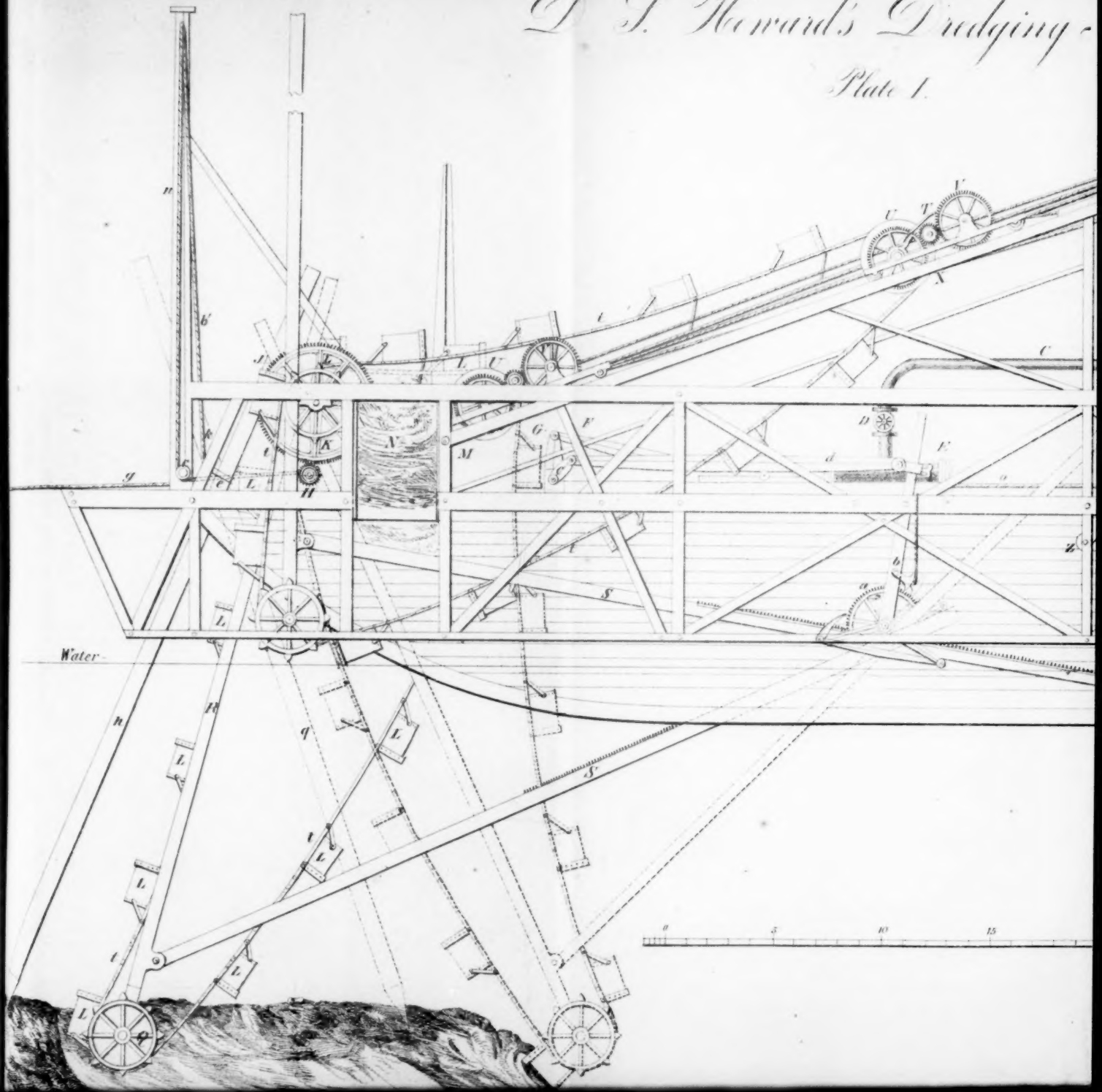
Claim.—"The employment or use of the barrel, hammer, with plate attached, spring, and tumbler."

14 For an *Improvement in Window Sash Supporter;* David Russell, Drewersburg, Ia.

Claim.—"1st, The curved form of the stop fasteners. 2d, The offset in combination with the fasteners."

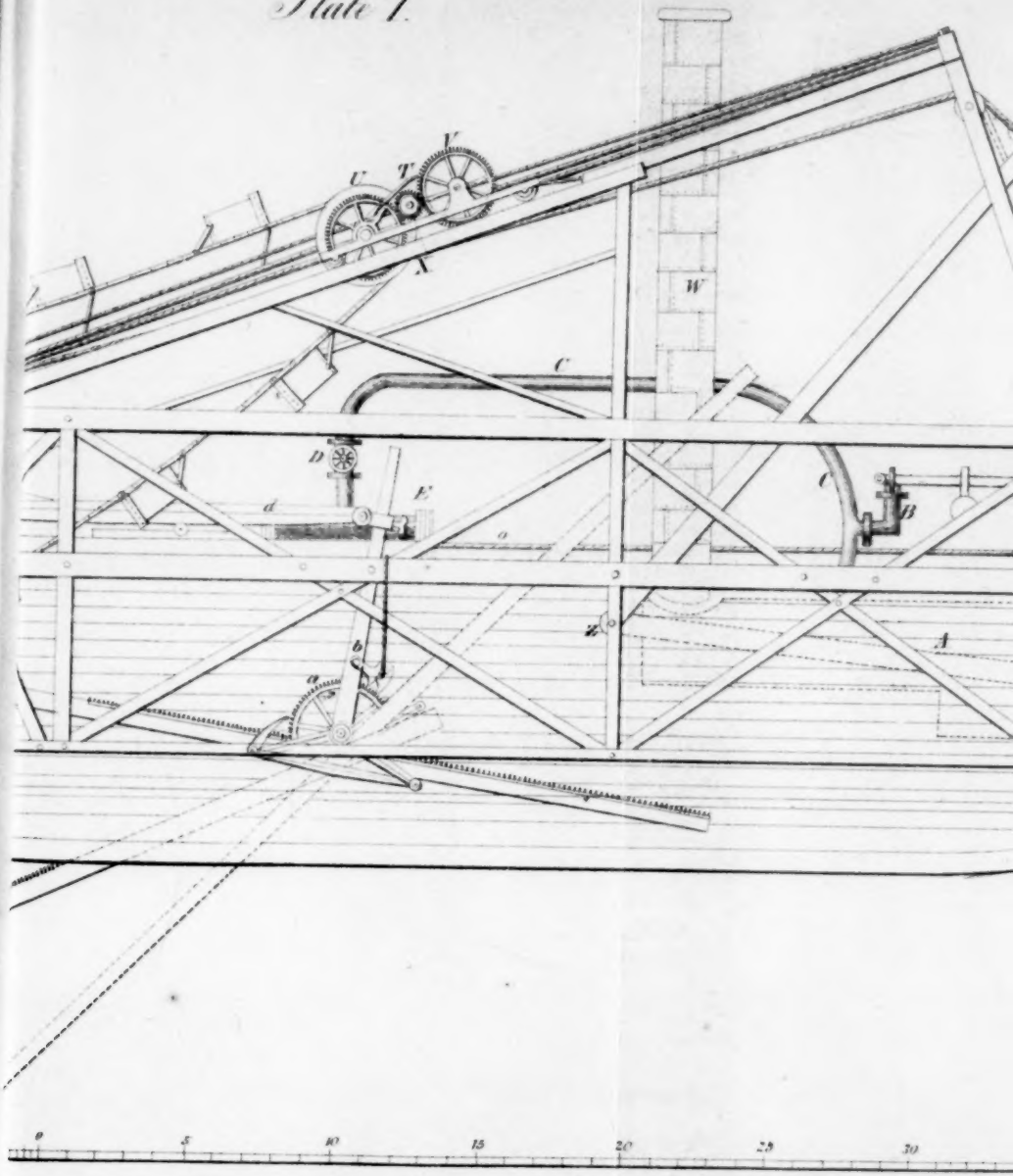
D. S. Howard's Dredging-

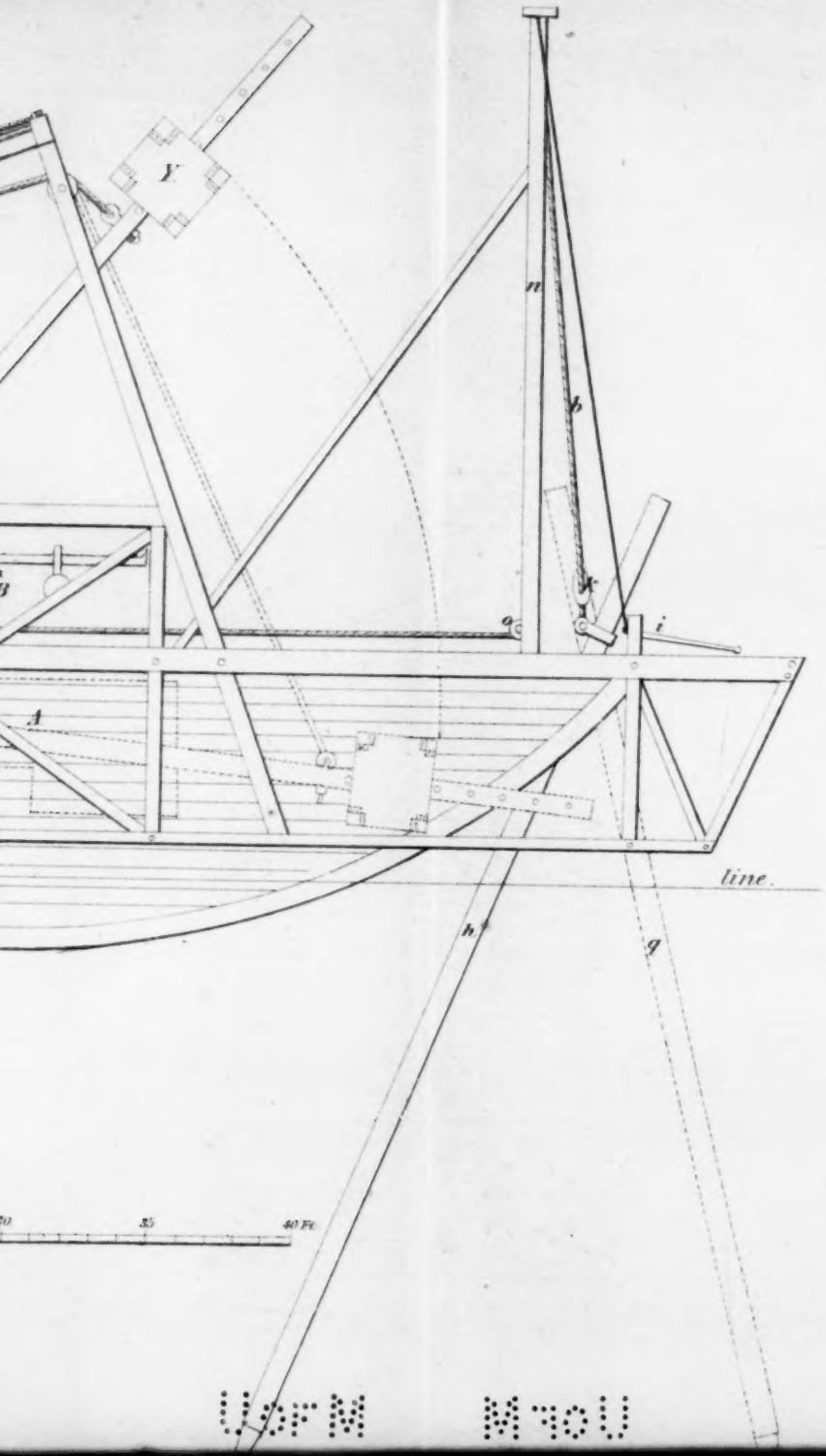
Plate 1.



Howard's Dredging Machine.

Plate 1.





UofM MIoU

so
by
fin

5.

gr
wi

6.

it
w

7.

pi
th

8.

ur
w
bc
in
fl

9.

pl
th
th

1(

pi
ol
a
a

1

s
a
1

s

1

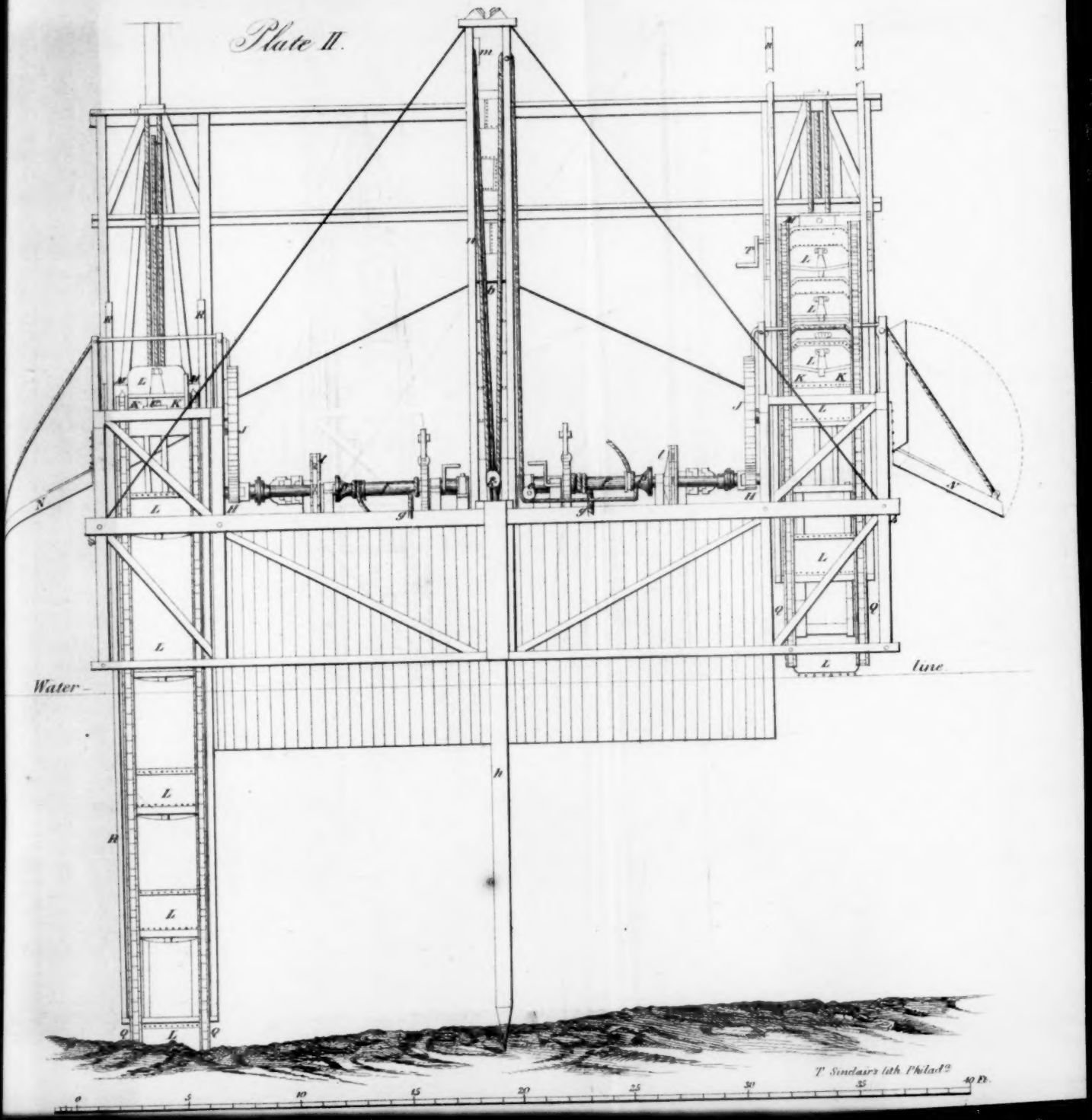
a

1

w

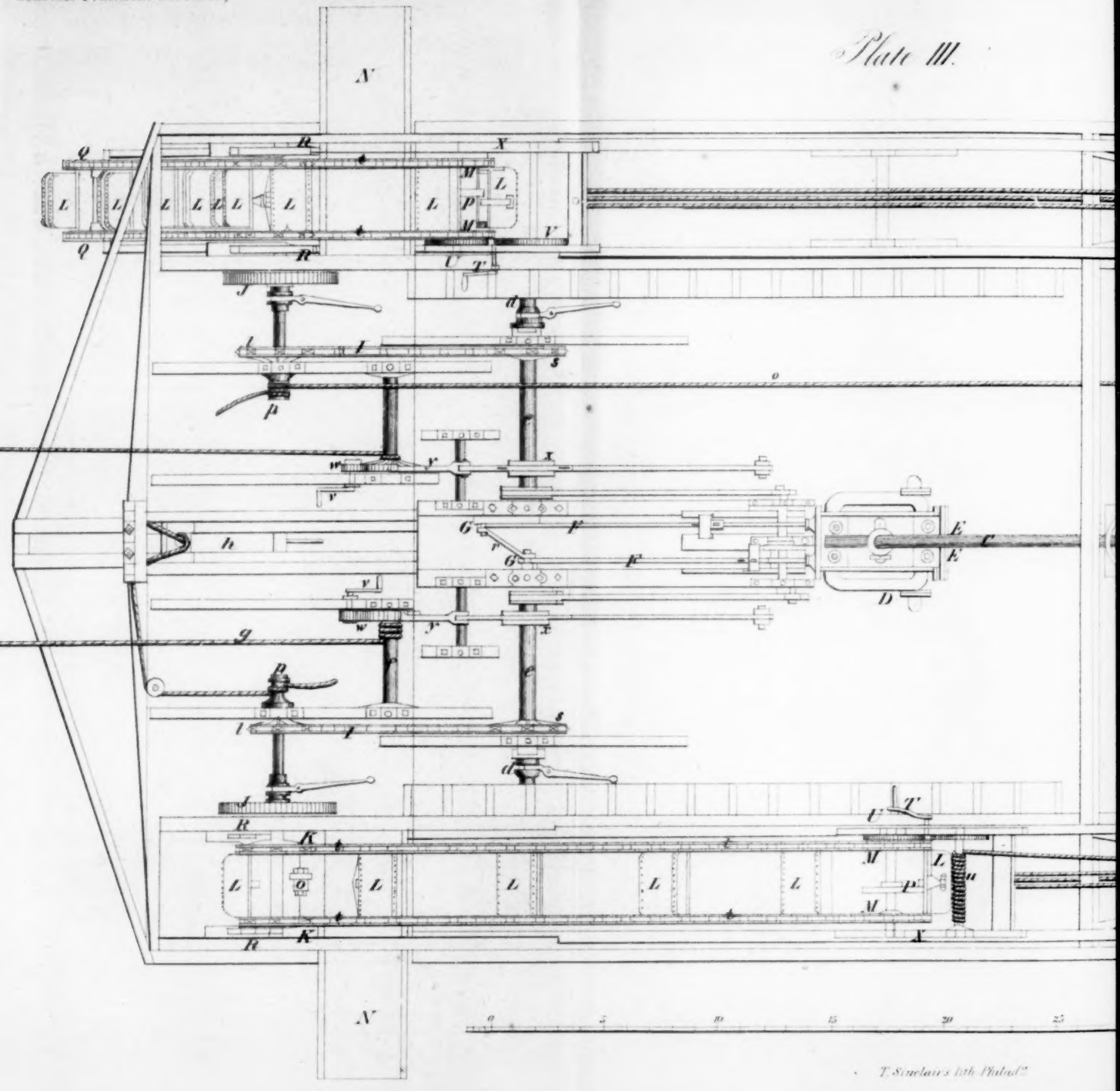
N

Plate II.



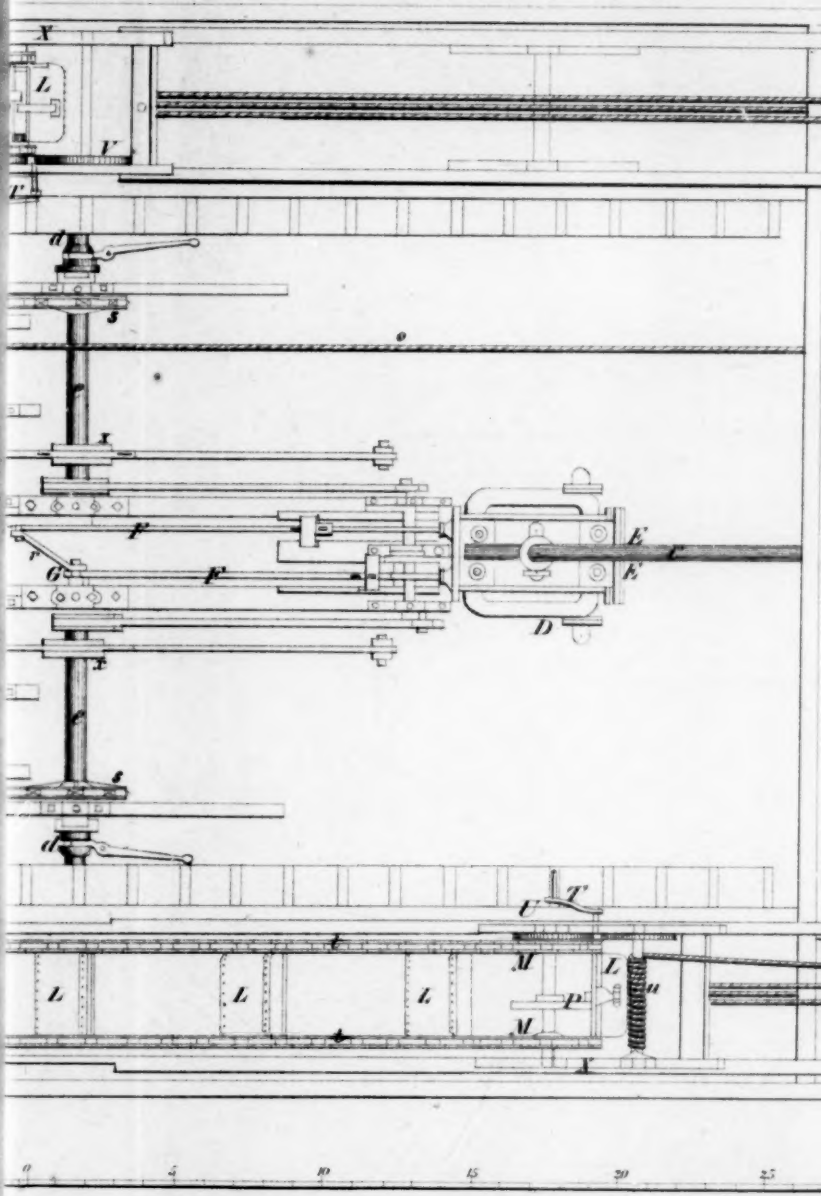
L

Plate III.

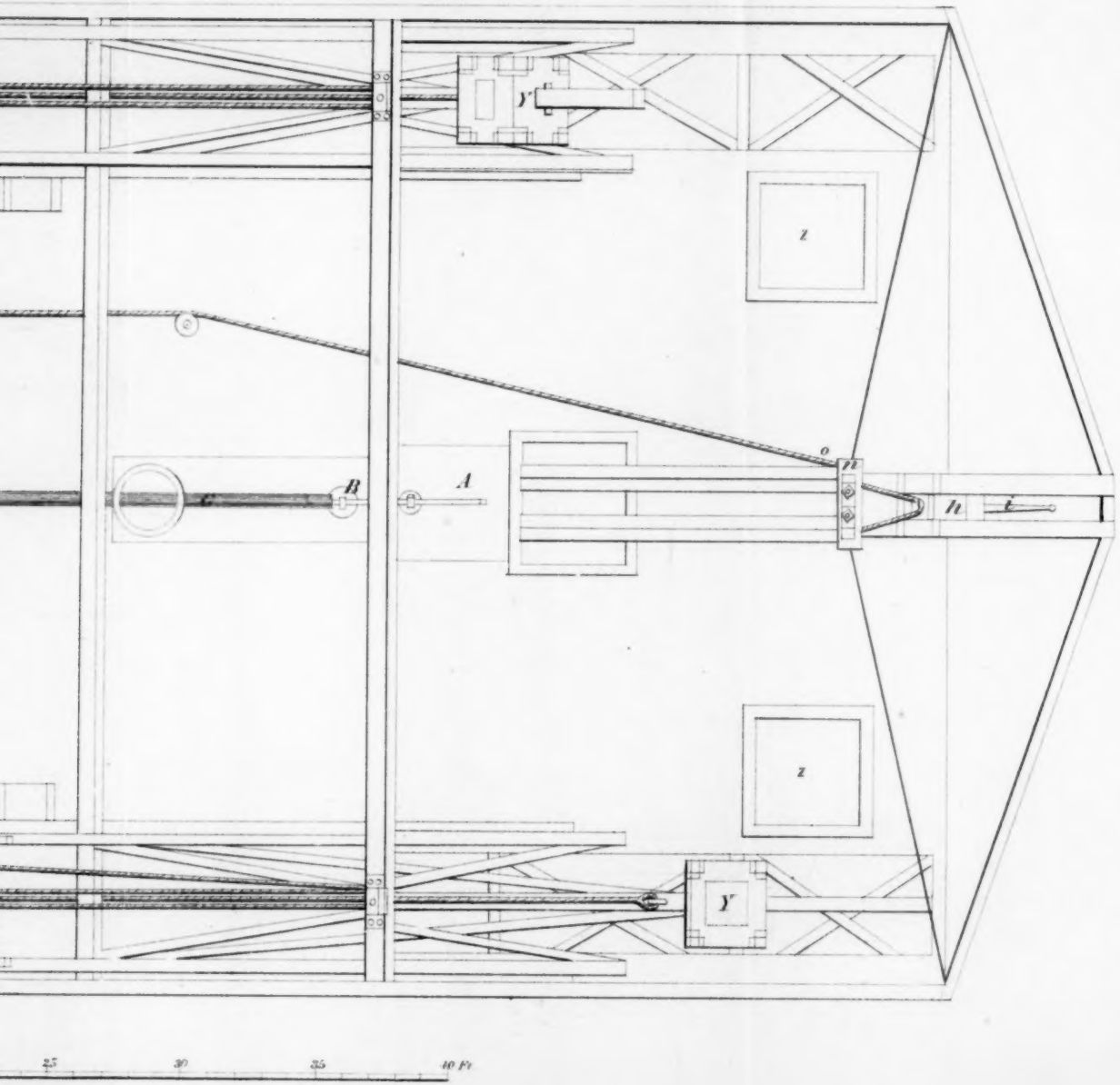


T. Sinclair's 4th Plate

Plate III.



T. Sinclair's lith. Philad.ª


Y
Z
o
R
A
h
Z
Y
25
30
35
40 Ft

15. For an *Improved Machine for Making Paper Bags and Envelopes;* John A. Smith, Clinton, Mass., and S. E. Pettee, Foxborough, Mass.

Claim.—"1st, The bar to relieve the end of the under sheet of the weight pile, partially or wholly. 2d, The friction bar, to separate the under sheet. 3d, The guide bar, in connexion with bar to hold the sheet in place for the jaws. 4th, The lifter, to relieve the sheet from the weight of the pile. 5th, The feeding from the bottom of the pile. 6th, The combination of the weight bar, friction bar, guide bar, and lifter, constituting a feeding apparatus. 7th, The jaws to place the paper in position. 8th, The former to fold the paper over or around. 9th, The pasters and side folders. 10th, The combination of the table, the bar, the side folders, and pasters, or any other substantially the same."

16. For an *Improvement in Bench Plane Stock;* George E. Davis, Lowell, Mass.

Claim.—"The metal plane stock having a formation of a lip, in the back part of its throat, so as to fill the recess which would otherwise be below the level of the cutting irons, so as to present a continuous smooth surface to the plane, excepting the edge of the cutting irons and throat forward of them for the outward passage of the shavings."

17. For an *Improvement in Alloys for Journal Boxes;* Thomas Firth, Cincinnati, Ohio.

Claim.—"A composition of matter, of copper and zinc in the proportions of seven and one-half parts of copper to ninety-two and a half parts of zinc, or any other mixture substantially the same, and which will produce the intended effect."

18. For an *Improved Machine for Sawing off Piles under Water;* James Fleming, Portsmouth, Va.

Claim.—"The combination of a circular saw and its shaft, carried in movable arms upon and around a stationary shaft, which sustains the driving pulleys, and which is fixed to an adjustable tongs or clamp for the purpose of cutting or sawing off piles under water. Also, the method of fastening to the pile to be sawed by means of a clamp or adjustable tongs, with suitable jaws and teeth. Also, the method of feeding a circular saw from points of resistance fixed upon a stationary shaft by means of arms, curved racks, and pinions."

19. For an *Improvement in Farm Gates;* Cornelius L. Harsen and Moses R. Brailey, Norwalk, Ohio.

Claim.—"The construction of farm gates with their several parts loosely connected, combined with the bent lever and diagonal rod, arranged and operating so as to elevate the gate in opening for the passage of obstructions."

20. For an *Improvement in Gang Ploughs;* Thomas J. Hall, Tawakana Hills, Texas.

Claim.—"The arrangement of the ploughs and pivoted beams with the adjustable cross beams, so that the ploughs have a convenient permanent adjustment in connexion with their self adjusting property in the plough beam."

21. For an *Improvement in Spring Rollers for Curtains;* John and Jacob Hartshorn, Boston, Massachusetts.

Claim.—"Attaching one end of the springs to the sliding block, for the purpose of enabling them to increase and diminish in length as they are wound up and expanded."

22. For an *Improvement in Boot and Shoe Stretchers;* Warren Holden, Philadelphia, Pennsylvania.

Claim.—"Dividing the last into a number of parts connected by rods and a link, and forcing said parts outwards, so as to stretch the boot or shoe at any desired part, or at all parts, by means of the device composed of the jointed levers, nuts, and rod."

23. For an *Improvement in Boot Crimping Machines;* Hosea B. Horton, Northville, Michigan.

Claim.—"The adjustable wires (made so by set screws) on the face of the jaws."

24. For an *Improved Projectile for Fire Arms;* Eben Hoyt, Jr., Chelsea, Mass.

Claim.—"The employment of inclined surfaces upon the rear end of the ball."

25. For an *Improvement in Mitre Box;* Matthew Spear, Bowdoinham, Maine.

Claim.—"The sliding index arch, as combined with the lumber bearers or supporters and the saw guide, and made to operate therewith. Also, the combination of the extra

grooves with the lumber supporters. Also, the combination of the grooves and said lumber supporters. Also, the combination of the adjustable gauge with the edge supporter, the same being to determine the length of the stuff to be operated upon. Also, the mode of constructing the head of the adjustable gauge, so that it may serve to increase the bearing for the stuff during the operation of mitreing the supplement of an angle. Also, the movable edge pieces, in combination with the lumber bearers. Also, combining with the curved arc, the inner index scale, for the purpose of enabling a person to adjust the machine for the purpose of mitreing to the supplement of any angle required. And, also, combining with the movable pieces the projecting lips."

26. For an *Improved Machine for Clamping Sash, etc.;* Solomon P. Smith, Half Moon, New York.

Claim.—"The employment or use of the clamps, operated by levers, and forming what is commonly termed a toggle joint, in combination with the adjustable heads."

27. For an *Improvement in Sewing Machines;* George W. Stedman, Vienna, N. J.

Claim.—"Feeding the cloth or other material along by means of a pin, or its equivalent, playing in a revolving shaft, which, at the proper moment in each revolution, brings it in contact with a stationary cam, or its equivalent, whereby the pin is pressed into the cloth, but again recedes therefrom as soon as freed from the cam. Also, the cam, upon a movable arm or its equivalent, so that by simply adjusting its position, the length of the stitch can be varied at the will of the operator."

28. For *Improvements in Machines for Burnishing Metals;* Jerh. Stever, Bristol, Conn.

Claim.—"The arrangement of the connecting rod of the burnishing slider, the rocker shaft, the slider, the rod, and the bow or stirrup, whereby the movement of the burnishers may not only be entirely arrested, while the rocker shaft is in motion, but may have given to it such an extent of reciprocating movement as occasion may require."

29. For an *Improvement in Furnaces for Heating Wrought Iron Wheels for Forging;* William R. Thompson, Cleveland, Ohio.

Claim.—"The arrangement of the furnace, with double fire places or chambers, furnished with flues and dampers in combination with the wind pipe and valves, for the purpose of alternately heating both sides of the hubs of wrought iron wheels or other articles, between the nozzles."

30. For an *Improvement in Projectiles;* Wilderich Jos. Von Kammerhuëber, Washington City, D. C.

Claim.—"The lens shape of the projectile, made of any desirable material or combination of materials, solid or hollow, and which projectile is to be thrown by any exploding or expanding substance."

31. For an *Improvement in Arranging Shafts and Pulleys at an Angle;* Abner Whitely, Springfield, Ohio.

Claim.—"The mode of arranging the bearings, consisting of the stud or projection from the bearing of one shaft, which stud is a bearing for the pulley, gear wheel, or coupling of the other revolving part, and through which the axis having the pin passes, for the purpose of forming a secure and compact adjustment of the parts when the respective axes of motion have a fixed and invariable angle with each other."

32. For an *Improved Lubricator;* Robert M. Wade, Wadesville, Virginia.

Claim.—"Constructing the moving parts of a central sectional spindle, with disk valves at its extremities, susceptible of steam-tight adjustment, and combining the same with the perforated diaphragm of the oil reservoir, for preventing external leakage, and otherwise acting. Also, the sectional rim and spring in combination with the arrangement of the valve apertures relative to the ends of said rim, so as to furnish there stopping points to the actuating lever for feed discharge, and the entire closing of the lubricator when operating."

33. For an *Improvement in Self-Loading and Unloading Carts;* Jonathan Wilkinson, Hopewell Cotton Works P. O., Pennsylvania.

Claim.—"The combination and arrangement in one vehicle of a series of two, three, or more comparatively small scoop shovels or scrapers and their respective carrying boxes,

so that each of the series can be loaded in succession, independently of the others, while the vehicle is in motion, thus, owing to the shortness from front to rear of the scoops to be forced into the substance with which the cart is to be loaded, and the smallness of the quantity to be taken up by each, avoiding the necessity of employing a powerful team, or of hitching on an extra team while the vehicle is being loaded, as is usually the case in taking up a sufficient load for an ordinary team in a cart having but one large scoop; and so that when the vehicle is removed to the place where the load is to be deposited, all the boxes of the series can be dumped or unloaded simultaneously without stopping the team, and leave the contents spread out in a layer of uniform or nearly uniform depth, or in any other manner substantially equivalent thereto. Also, the manner of operating the scoop and boxes by means of levers connected to them by two rods, or their equivalents, to each lever, the one attached to the box being connected with the lever nearer its fulcrum than the one attached to the scoop, so that operating the lever will move the scoop through a greater space than it does the box, thus enabling the scoop to be depressed a sufficient distance to take up its portion of the load, and then elevated so as to constitute the front of the carrying box, while at the same time, the box is elevated by the rod attatched to the lever nearest its fulcrum, a sufficient distance to be clear of the surface over which the vehicle is to be conveyed. Also, the manner of attaching the scoop boxes to the adjustable frame, and the adjustable frame to the fixed frame, by means of sliding bars or rods, or their mechanical equivalents, so constructed and arranged that the scoops and boxes are capable of a vertical but not of a horizontal motion, except as the whole vehicle is moved, thus enabling the scoops while being loaded, to be held firmly at any desired depth against the substance to be taken up by them."

34. For an *Improved Arrangement of Means for Regulating the Discharge of Exhaust Steam in Locomotives;* John E. Wootten, Philadelphia, Pennsylvania.

Claim.—"The arrangement of the piston within the cylinder, in combination with the steam or water space of the boiler, and with the exhaust chamber in relation to the spring, rods, and levers, and beams, and valve."

35. For an *Improvement in Machines for Polishing Leather and Morocco;* Nathan Ames, Saugus, Mass., Assignor to Samuel Green, Lynn, Mass.

Claim.—"The method of raising the figuring or polishing tool, while passing back over the table, *i. e.* by making the tool holding hand in effect a fixed part of the connecting arm, so that the machine partaking of the nature both of a reciprocal and rotary motion, may operate without joint, noise, or friction, as easily and silently as a wheel revolving on its axle, and as rapidly as may be desired, and at the same time moving in a uniform ellipsoidal orbit over the table without touching it."

36. For an *Improved Furnace for Burning Bagasse;* Elizabeth A. Stillman, Administratrix of Alfred Stillman, deceased, City of New York.

Claim.—"The furnace for employing Bagasse, without previous drying, as fuel for generating steam."

37. For a *Machine for Boring Fence Posts;* Jas. Temple, Assignor to Israel Ward and James Temple, Birmingham, Pennsylvania.

Claim.—"The supporting of the long pinion and the auger shanks in the adjustable hinged pillar blocks, so that the augers may be set to bore holes at variable distances apart, whilst the spur wheels on their shanks shall still keep in gear with the long pinion."

38. For a *Machine for Sawing Fire Wood, &c.;* Elias A. Tubbs, Hampton, N. H., Assignor to E. A. Tubbs, and H. T. Croxon, Dorchester, N. H.

Claim.—"1st, The method of bringing the saw into operation by the pressure of the log upon the stop. 2d, The method of causing the weight of the saw, after it has passed through the log, to bring into operation the mechanism which raises it out of the way preparatory to making another feed. 3d, The method of operating the clamp, by means of the spring bar, whereby the clamp is rendered capable of holding logs of varying thicknesses, without constant readjustment. 4th, The device for the purpose of stopping and starting the feed at the required moment, consist essentially of the combination of the shaft, the lever, the wheel, and the shipping finger."

MAY 8.

39. For an *Improvement in Tape Fuze;* Philip Bacon, Sinsbury, Conn.

Claim.—"The application to tape fuze of an external winding of thread, whereby the loosening or cracking off of the tape and water proofing substance is effectually prevented, and the manufacture of the fuze cheapened and simplified."

40. For an *Improvement in Seed Planters;* George W. Brown, Galesburg, Illinois.

Claim.—"In combination with the hoppers, and their semi-rotating plates, the runners, with their valves, and their adjustment by means of the levers and cams, and the driver's weight, for the purpose of carrying and dropping seeds by each vibration of the lever, and to regulate the depth of the planting."

41. For an *Improvement in Preparing Turpentine for Distillation;* Alex. C. Blount, Mount Pleasant, Alabama.

Claim.—"Freeing the crude turpentine of chips, bark, straw, and other impurities and coloring matters before introducing it to the still, by melting it in a cylinder or vessel which contains one or more sieves, and is arranged in such manner that the melted turpentine may run from it to the still by gravitation."

42. For an *Improvement in Stone and Marble Saws;* J. T. Bruen, City of New York.

Claim.—"Making the body of the saw plate of woven wire or strips of metal, or any analogous device, for the purpose of admitting the free passage of the grit, in the operation of sawing stone. Also, in combination with the above, the waved cutting edge or any analogous device. Also, forming the edges of the saw blade thicker than the central portion, so as to admit of the free passage of the grit on both sides, through the indentations."

43. For an *Improvement in Lamps for Burning Fluid;* Dexter H. Chamberlain, West Roxbury, Massachusetts.

Claim.—"The employment of granulated pomice stone as a packing for spirit lamps and other vessels containing any inflammable hydro-carbon."

44. For an *Improvement in Machines for Making Bolts;* Robert Critchton, Buchanan, Pennsylvania."

Claim.—"The combination of the adjustable shaft, the detached shaft, the spring and stop, with the sash, and horizontal heading tool, to regulate the quantity of iron in and thickness of head."

45. For *Improvements in Boot Crimps;* Thomas Dougherty, Erie, Pennsylvania."

Claim.—"1st, The projections, to which the leather may be tacked after it is stretched, thereby permitting the stretching apparatus to be removed and applied to another crimping board." 2d, The nut, with projections fitting upon both sides of the elbow."

46. For an *Improved Faucet;* William Fowler, City of New York.

Claim.—"Having the lower end of the tube fitted within a valve seat, which seat is screwed into the upper part of a socket, at the upper part of the main pipe or tube, and adjusting the lower end of the tube snugly within the valve seat, by means of the nut, the tube turning within the seat; the seat and tube being provided with openings, which when made to coincide with each other by turning the nozzle and tube, allow the water to pass up through the nozzle."

47. For an *Improvement in Railroad Car Ventilators;* D. H. Fox and John Fink, Reading, Pennsylvania.

Claim.—"The construction in or on the top of the car of a long shallow chamber communicating at several points with the interior of the car, and by a tube with a fan chamber beneath the car, whereby the partial exhaust created in said chamber by the running of the car, produce a number of upward currents simultaneously in various parts of the car, sufficient to carry off the vitiated air and dust from the same."

48. For an *Improvement in Dissolving Silica;* Benj. Hardinge, City of New York.

Claim.—"Filling the pipe with the water from the upper stratum in boiler so constructed as to find its common level in pipe, in furnace, from whence the heated steam

is forced over and down into the under stratum of the heavy silicates by the horn-pipe, while the steam pressure is relieved from the surface by my relief pipe, which coils through the tank of cold water."

49. For an *Improvement in Facing Beds for Grinding Artificial Granite, &c.*; Benj. Hardinge, City of New York.

Claim.—"The artificial grind-stone or facing bed, consisting of a saucer-shaped dish filled with a concrete of the materials specified, or other substantially the same. Also, the suspension of the shaft which carries the rotary facing bed upon steel supporters."

50. For an *Improved Machine for Sawing or Felling Trees*; Simon Ingersoll, Greenwich, Connecticut.

Claim.—"Giving to the segmental saw its reciprocating action during the forward feed of the same by means of the pitman, connected by link rod, K, to the saw frame, and by joint or link rod, T, to the side carrying the saw, or saw frame, and giving feed thereto."

51. For an *Improved Mode of Checking Wind-Mills*; A. Lempeke, Pleasant Mount, Pennsylvania.

Claim.—"Operating the sleeve or collar, or moving said sleeve or collar on the shaft, towards the wings or sails, by means of the screw on the shaft rod, attached to the sleeve or collar and lever, whereby the chains are slackened and the wings or sails are allowed to turn edgewise to the wind, and consequently stopping the mill."

52. For an *Improved Propeller*; Henry Link, Little Falls, New York.

Claim.—"A semi-circular propeller, whether the same is used with or without hinged paddles."

53. For an *Improvement in Grain Harvesters*; T. N. Lupton, Winchester Virginia.

Claim.—"The employment or use of the cutters, placed on the rotating shaft, in combination with the two sets of fingers."

54. For an *Improvement in Grain and Grass Harvesters*; John H. Manny, Rockford, Illinois.

Claim.—"The combination of a removable auxiliary divider with a fixed divider."

55. For an *Improvement in Guides for Hemming and Cording*; Henry B. Odiorne, Philadelphia, Pennsylvania.

Claim.—"The curved retainer, with its notched end, in combination with the shoe, for effectually keeping the cord in contact with the inside of the hem of the fabric, while the said hem is being operated upon by the needle and thread of a sewing machine."

56. For an *Improvement in Ventilating Railroad Cars*; W. Pauli, Alexandria, Va.

Claim.—"The arrangement of guard sash, on the sides of the cars, in connexion with descending tubes and hood upon the top thereof, by which the dust is prevented from entering a window when opened, while the exit of the air and ventilation of the car is not affected by said guard sash."

57. For an *Improvement in Window Sashes*; Lyman E. Payne, Yazoo City, Miss.

Claim.—"Having strips attached to the inner sides of the frame casing, the outer edges of the strips being inclined or beveled, and fitted within rebates, in the inner surfaces of the stiles of the sashes, the shoulders of said rebates being inclined or beveled, so as to correspond inversely with the edges of the strips."

58. For an *Improvement in Spark Arresters*; Gilbert Richards, Cummington, Mass.

Claim.—"The spiral flanch and deflecting plates."

59. For an *Improved Balance-Gate Faucet*; Ezra Ripley, Troy, New York.

Claim.—"The combination of the duplicate discharge gates of the faucet tube with the duplicate discharge cut-off gates; the two parts being combined for the purpose of forming a balance discharge and cut-off gate, for faucets or fluid gates."

60. For an *Improved Nozzle for Hose-Pipes*; Albert W. Roberts, Hartford, Conn.

Claim.—"The combination of two or more movable nozzles or tips of different sizes attached to one pipe, which can be moved by the pipe holder or his assistant, to change the size of the stream when in motion, for fire engines or for other purposes."

61. For an *Improved Machine for Leathering Tacks;* M. M. Rhodes and J. C. Rhodes, Taunton, Massachusetts.

Claim.—"1st, The employment of a hollow cylinder with an opening in the side to receive the tacks, and a driver working within it in a suitable manner to expel the tacks at the end of the cylinder, and drive them into the leather or any material serving the same purpose which is presented in a suitable manner to receive them. 2d, Operating the cylinder and driver, so that the former may receive a short, and the latter a long movement, and that the final operation of the former to cut the leather or other material on the punch may not take place till after the termination of the operation of the latter in driving the tack through the said leather or material, but may be produced by a continued movement of the latter after it has driven the tack through. 3d, The divider, consisting of one or more tongues, having a straight edge working nearly close to and across the entrance of the receptacle into which the tacks are fed to be submitted to the operation of the driver, and having a beveled end terminating in a point to separate the tacks one by one, as they are brought by the feeder contiguous to the aforesaid receptacle, and to conduct and push them as required into the said receptacle. 4th, Forming the mouth of the barrel with a projecting lip, for the purpose of passing outside the point of the tack as the barrel rises, and the tack is entering the mouth, and thereby preventing the point from going down the outside of the barrel, and letting the tack fall head foremost into the barrel."

62. For an *Improvement in Sash Supporters;* Charles R. Rode, City of New York.

Claim.—"Having a longitudinal shaft or rod inserted in the lower cross piece of the sash, a pawl being attached to each end of the shaft or rod, said pawls catching into racks attached to the back sides of the grooves in which the sash is fitted, the shaft or rod being provided with a thumb piece which projects through a mortise or slot in the cross piece of the sash, and directly over a plate attached to said cross piece."

63. For an *Improvement in Processes for Preparing Liquids for Aiding Digestion;* Josiah J. Sherman, Albany, New York.

"My improvement consists in changing the condition of the alimentary or other digestible matter contained in malt liquor beverages by infusing a solution."

Claim.—"New Composition."

64. For an *Improvement in Apparatus for Regulating Supply of Water to Steam Boilers;* Thomas J. Sloan, City of New York.

Claim.—"The employment of the feed water before it enters the boiler, as a motor for giving the alarm when the water is too low in a steam boiler or generator, in combination with the float inside the boiler for indicating the level of water, and setting the mechanism that the alarm may be operated by the mechanism receiving motion from the feed water. Also, stopping the supply of water to the boiler by the employment of a stop to check the working of the valve, but this only when the said stop is simply set by the float within the boiler."

65. For an *Improvement in Fire Arms;* John Stowell, Charlestown, Mass.

Claim.—"The method of effecting the connexion between the hammer and the lever, D, by which the sliding crotch is operated by means of a lever, *d*, and two stirrups."

66. For an *Improved Machine for Rolling Railroad Rails;* A. J. Suffern, Suffern, N. Y

Claim.—"The employment of three rollers in combination, arranged with their axes in the lines of an equilateral triangle, each roller having a projecting fillet, and a groove each side, and the three working in unison, for rolling three tread rails, each roller forming the surface from the middle of one tread to the middle of the next, and the groove between of such form that each head or tread may be wider than the thickness of the shank."

67. For an *Improvement in Ploughs;* E. C. Tavenner and Oscar Nesmith, Hamilton, Va.

Claim.—"The land-side plate, in combination with the fend-off cleaner."

68. For an *Improvement in Smut Machines;* Grant B. Turner, Cuyahoga Falls, Ohio.

"The nature of my invention consists, first, in interposing between the runners and outer concentrators of the machine, a perforated flanch, which I term a partial concentrator, for separating and removing the smut without allowing it to commingle with grain

after it is once loosened from it. Also, in the method of escaping the white caps and other lighter material from the screen in the wind trunk."

Claim.—"In combination with the scouring disk or runner, and outside concentrator, the inner perforated and partial concentrator, slightly elevated from the outer one. Also, in combination with the screen in the blast trunk, the opening directly under said screen, to allow the white caps which may have passed through the scouring plates to pass out, instead of being held up against the bottom of said screen by the blast."

69. For an *Improvement in Silvering Looking-Glasses;* Joel Webster, Brooklyn, N. Y.

"This invention is for silvering common glass, which by reason of unevenness of surface will not bear pressure upon a hard flat table."

Claim.—"1st, The two tables having elastic faces and being employed in combination with each other. 2d, When the requisite elasticity is given to the faces of the tables, by the employment of an air packing, connecting the air cavities, by means of a flexible tube, by which means both cavities are caused to be filled with air at once and to contain an uniform pressure."

70. For an *Improved Inkstand;* Henry Whitney, Jr., Cambridge, Massachusetts.

Claim.—"The well and the cylinders, in combination with the piston and the cylinders, for the purpose of raising and sustaining the ink above its level in the inkstand without the necessity of using the tight packed joint heretofore required."

71. For an *Improved Shingle Machine;* Andrew P. Wilson, Piqua, Ohio.

Claim.—"Mode of adjusting the block out of which the shingles are to be cut, by means of the adjusting slats underneath the doors, and also the springs for supporting the shingle; also the cleaners, for the purpose of cleaning the shingle from between the knife and springs, and for the purpose of keeping the doors clean from all substances that may fall on them."

72. For an *Improved Method of Sawing a Log by its own Weight;* Francis A. Wolff, Ripley, Mississippi.

Claim.—"The method of making the weight of a log or logs of timber propel the saws which saw them, by suspending them on endless chains, working around chain wheels, which drive the saws."

73. For an *Improvement in Gas Regulators;* G. B. Woodruff and James N. Palmer, New Haven, Connecticut.

Claim.—"1st, The employment of adjustable escape tubes or passages, at the upper part of the air chamber, in connexion with valves attached to a float which rises and falls with the water in the air chamber, the said valves acting to close the said tubes or passages to confine the air in the air chamber when the water or other liquid reaches a certain level therein, and thus prevent the water being in the gas chamber pressed down below the regulating float. 2d, The employment of two induction valves, arranged and connected by a spring, in such manner that when the pressure of gas in the gas chamber increases to such a degree, that the action of the float would close both of the said valves, and entirely shut off the gas, the said spring will yield to the pressure of the gas upon the under side or front of one of the valves, and allow that valve to remain open until the pressure in the gas chamber is reduced, and the level of the liquid therein is restored sufficiently to open the other valve."

74. For an *Improvement in Plating and Twisting Cord;* William H. Zahn, Assignor to F. Renter, City of New York.

Claim.—"The arrangement for driving the flyers, consisting of the circular rack, gearing with the spur wheels, said rack being on a table, which has a central pivot, through which the spindle of the flyer frame passes, whereby the flyers are set in operation, whether the flyer frame or the table revolves, and are enabled to receive merely a rotary movement on their own axes for making twist, or such rotary movement combined with a revolution round a common axis for making cord."

75. For an *Improvement in Apparatus for Manufacturing Starch;* Hendrick V. Duryea, Oswego, New York, Assignor to Oswego River Starch Company.

Claim.—"The construction and adaptation of the rake, furnished with teeth, and hung on chains, for digging, cutting up, and loosening starch deposits."

76. For an *Improvement in Artificial Fuel;* Thomas Hoooker and Wm. D. Beaumont, Assignors to A. A. Pray, N. M. Harris, E. C. Lemoyne, J. R. Jennings, G. G. Kirk, and L. A Kirk, New Orleans, La.

Claim.—"The manufacture of a new article of fuel, composed of lime, fine coal, clinkers, rosin, carbonate of ammonia, and bagasse, or their equivalents, mixed in the proportions (one hundred and forty parts of any of the known formations of earth; thirty parts of common lime; twenty parts of the dust or refuse of coal; two parts of clinkers or iron dust; three parts of common rosin or pitch; two parts of carbonate of ammonia; eight parts of saw dust or chips.")

77. For an *Improved Machine for Sawing Wedges or Shingles;* J. Taggart, Roxbury, Mass., Assignor to self and Nehemiah Hunt, Boston, Mass.

Claim.—"The peculiar combination of mechanism employed for moving the bolt forward, and changing its position, so that a shingle or wedge shall be removed from it by the saw during each longitudinal movement of the bolt produced by the main carriage, the said combination consisting of the carriage, the turning bearer, its lifting catches, the notched racks, the two levers, the stationary lifters, and the stationary rails, the whole being combined with the main reciprocating carriage and the frame of the machine, and made to operate together and with the circular saw."

MAY 15.

78. For an *Improvement in Circular Metallic Plate Springs;* John W. Adams, City of New York.

Claim.—"The combination and arrangement of one or more flat circular steel plates held in place by a central pin, and allowed to spring a limited space between solid convex and concave metallic plates."

79. For an *Improvement in Sleighs;* David S. Barber, Almon Thompson, and De Algeroy Thompson, Pittsfield, Vermont.

"The nature of this invention consists in providing the running gear of any common sleigh or sled with four wheels, on which the sleigh may instantly be made to run, which is done by means of two crank or angle shaped axles operated by a connecting rod and lever, so that the wheels may be thrown below the runners of the sleigh so as to run on the ground, or may be thrown or raised up so that the sleigh will run on its runners: thus it may be made to operate either as a sleigh or wagon."

Claim.—"The attachment of wheels to a sleigh."

80. For an *Improved Ventilating and Cooling Apparatus;* Job R. Barry, Philadelphia, Pennsylvania.

Claim.—"The arrangement of a fan and one or more refrigerating wheels, or their equivalent, with the water tanks, ice reservoir, and return air flue, for securing effectual ventilation and cooling the air."

81. For an *Improvement in Rosin Stills;* Francis Bowman, Somerville, Mass.

Claim.—"The arrangement of section G, of the still by inserting the metallic tube, and section of a tube covered with glass inside and outside, or a similar tube not covered with glass, projecting at any distance from the inside towards the centre of section G. Also, the suspension of the inverted bowl covered with glass inside and outside. I also claim the formation of an arch under the still, constructed of fire brick, soap stone, or any other substance, to prevent the fire from touching the bottom of the still."

82. For an *Improvement in Double Acting Spring Hinges;* Henry E. Canfield, City of New York.

Claim.—"The attachment to one pin of two flat coiled springs, coiled in opposite directions, in combination with the holder, or its equivalent."

83. For an *Improvement in Window Sash Fixtures;* Handel S. Chaplin, Glover, Vt.

Claim.—"Arranging two spring friction bolts, their retractive arms, cams, and one rocker shaft together, and with respect to two window sashes."

84. For an *Improvement in Connecting Clamps for the Plates of Galvanic Batteries;* Charles T. Chester, City of New York.

Claim.—"The arrangement for fastening and connecting the battery plates, viz:

Clamps of brass or such other metal as will alike answer the purpose of the arrangement attached to the insulating bar of wood commonly used in Simes' Battery in such manner, that the battery plates clamped to them shall be separate from the wooden bar, and the solution be prevented from finding its way by capillary attraction to the wood, and which shall, by their form, allow of an easy removal and replacement of each separate plate without the disturbance of any other part of the battery arrangement."

85. For an *Improvement in Sewing Machines;* John Chilcott and James Scrimgeour, Brooklyn, New York.

Claim.—"The arrangement of the revolving disk within or on the fixed table, and having its axis in line with the needle, when combined to operate together with a roller bearing on the opposite side of the cloth, and made adjustable to any position in a circle round the centre of the said disk, to vary with facility and despatch the run of the seam in lines on any side of the needle without the aid of guides on the face of the table, and whether the revolving disk or bearing roller be caused to move the cloth."

86. For a *Machine for Splitting Wood;* Jacob A. Conover, City of New York.

Claim.—"The movable bed or carriage for carrying and advancing the blocks of wood, in combination with the reciprocating cutters operating at right angles with the surface of the bed or carriage. Also, in combination with the bed or carriage and reciprocating cutter, the employment of the clearing plate through which the cutters pass. And finally, I claim providing the said clearing plate with an elastic pad, and imparting to it an up and down motion, in its combination with the bed or carriage and reciprocating cutter, by means of which the said plate, under the combination, performs the double office of holding the blocks and clearing the cutters."

87. For an *Improvement in Cording Guides for Sewing Machines;* Henry W. Dickinson, Hartford, Connecticut.

Claim.—"1st, A holder or presser to a sewing machine formed with a groove to hold a cord in its place while being stitched into cloth or other material for the purpose of forming a corded seam. 2d, Forming the face or bearing side of an adjustable guide with grooves, so arranged as to receive and act upon a finished corded seam, and guide the cloth parallel while stitching another seam or sewing in another cord."

88. For a *Velocitrat Lubricator;* George Dixon, Lafayette, Indiana.

Claim.—"Providing oil cups of crank pins and other movable journals with a valve."

89. For an *Improved Mowing Machine;* Ezra Fahrney, Mount Morris, Illinois.

Claim.—"The employment of the two self-adjusting slides, with the two cams, arranged a short distance apart on a wheel having a slower motion than the beater shaft."

90. For a *Gauge for Slitting Lumber;* Francis P. Hart, Chandlersville, Pa.

Claim.—"1st, The employment of a rotary cutter secured to the shaft of the gauge when the said shaft screws into the stock, and is made capable of turning freely therein, for the purpose of gauging taper work. 2d, Attaching the adjustable scriber by a hinged joint constructed with a shoulder, to the slider which carries it, so that it may be rigid when extended for mortising, but may fold into the recess in which the said slider works when the gauge is used for other purposes than mortising. 3d, The employment of a round faced guide piece, fitted to slide within the stock of the gauge, so as to be withdrawn into it when the gauge is to be used for straight work, but to be protruded from it when required to serve as a guide for gauging curved, circular, or irregular work."

91. For a *Mitre and Beveling Machine;* Lorton Holliday, Rogersville, N. Y.

Claim.—"The manner of arranging and combining the several parts constituting the mitre box; whereby the saw guide is rendered capable of being adjusted in the path of a horizontal circle as well as in the path of a vertical circle to any angle desired, and enables the saw to cut a bevel lap on the strip or board simultaneously with the sawing of the mitre or angle, and also indicates the angle cut."

92. For an *Improvement in Condensers for Fibrous Materials;* William H. Howard, Philadelphia, Pennsylvania.

Claim.—"The combination of the several parts for conducting and condensing the fibrous material from the doffer of a carding engine to the spool, to wit, the two sectional

rolls working in contact with each other, and the upper one in contact with the doffer for doffing and conducting the sliver from the doffer. Also, the two series of convex disks mounted upon shafts in front of and parallel to the said rolls, with the guide plate to govern the position of the slivers between the said disks for twisting and condensing the slivers as they are conducted from the doffer to the spool. Also, the manner of constructing the upper parts of the guides of the journals of the spool, to wit, making the outside portion thereof form parts of levers, whose operation is controlled by a bar or weight and a catch."

93. For an *Improved Adjustable Tenoning Tool;* Thos. J. Knapp, Philadelphia, Pa.

Claim.—"The construction of the tool, viz: having two segments of a cylinder secured to the flanch of the shank by screws, and having screws pass through the flanches and projections of both segments, for the purpose of allowing the segments to be placed nearer together or further apart, as desired, and having a hub or boss at the centre of the face of the flanch to receive the rings of different sizes corresponding to the diameter of the tenons to be cut, and by which rings the segments are properly adjusted the required distance apart for the purpose of cutting tenons of various sizes."

94. For an *Improvement in Spark Arresters;* David Matthew, Philadelphia, Pa.

Claim.—"The annular space between the base of the smoke pipe and the section extending down into the smoke box, with the exhaust pipes underneath."

95. For an *Improvement in Curtain Fixtures;* Perches Miles, Hartford, Conn.

Claim.—"The combination of the cords with the tassel and cam lever, the whole being arranged and operating for the purpose of making a simple, neat, and effective curtain fixture."

96. For an *Improvement in Cotton Seed Planters;* A. H. Morrel, Marlin, Texas.

Claim.—"The combination of sliding bar, cover, cam, and eccentric shaft, or their equivalents."

97. For a *Mode of Securing Brace Bits in their Sockets;* Ebenezer W. Nichols, Worcester, Massachusetts.

Claim.—"The burr nut (or its equivalent) in combination with the spring, operating upon the wedge principle, (by the use of the screw) the projections."

98. For an *Improvement in Joint Bodied Carriages;* A. H. Niles, Georgetown, N. Y.

Claim.—"The application to joint bodied buggy wagons, and light carriages, of the additional joint and spring or any other which will produce the intended effect."

99. For an *Improved Method of Regulating Wind Mills;* Fras. Peabody, Salem, Mass.

Claim.—"Regulating the action of the wind upon the wheel by means of the disk."

100. For an *Improved Mode of Attaching Hubs to Axles;* John M. Perkins, City of New York.

Claim.—"Attaching the hubs to axles by having segment projections attached to the back end of the hub and lips on the inner surface of a cap which is placed loosely on the arm of the axle, said lips being fitted over the projections by turning the cap, and prevented from moving off the projections upon the backward movement of the wheel or vehicle by the pin."

101. For an *Improvement in Window Shutters;* George W. Phipps, Philadelphia, Pa.

Claim.—"The peculiar form of the side grooves in the frame tapering from the bottom to the top, increasing with the additional thickness given by the shutters in being lifted. Also, the supporting top bar and its grooves, and the vertical side bars. Also, the combination or arrangement of the upper bar, the vertical bars, and the slats to produce the effect alleged."

102. For an *Improvement in Steam Engine Valves;* John A. Reed, City of New York.

Claim.—"Beveling the edges of the cylindrical valve, or its equivalent, and beveling the edges of the steam ports, whereby I am enabled to move the valves within the ports; the beveled edges of the ports thus being valve seats, and the beveled edges of the valves being faces to fit thereto."

103. For an *Improved Slide Lathe;* E. K. Root, Hartford, Connecticut.

Claim.—"Giving to the tool-post slide a motion towards or from the line of the axis of

the mandrel, in combination with the longitudinal feed motion of the carriage, and derived therefrom or bearing a certain relation thereto."

104. For a *Hot Air Furnace;* S. J. Russell, Chicago, Illinois.

Claim.—"The employment of the vertical trunks, horizontal pipes, and horizontal plates connected with the fire chamber and enclosed by a casing."

105. For an *Improvement in Butter Coolers;* James H. Stimpson, Baltimore, Md.

Claim.—" The double wall cover and reservoir with a diaphragm or shelf between them. Also, making the support for the butter knife upon the cover or handle, one or both, so that the knife cannot be put in place without closing the lid, thereby securing the economy of ice and the hardness of butter."

106. For an *Improved Machine for Polishing the Soles of Boots and Shoes;* John H. Thompson, James M. Thompson, and H. Q. Thompson, Holderness, N. H.

Claim.—"A machine having a polisher or polishers made of bone or other proper material attached to a shaft which has a reciprocating motion imparted to it in any desirable manner."

107. For an *Improvement in Machines for Creasing the Edges of Leather Straps;* Wm. McK. Thornton, Pottsville, Pennsylvania.

Claim.—"The movable collars of different sizes on shaft F, in combination with the movable metallic creasers on shaft H, having flanches extending below the periphery of the collars and shoulders with grooves."

108. For an *Improvement in Temples for Looms;* Jeremiah C. Tilton, Sanbornton Bridge, N. H.

Claim.—"The combination of the serrated spring hook and the spring cloth bender."

109. For a *Device for Adjusting Planing Machinery;* Leonard Tilton, City of N. Y.

Claim.—"1st, Hanging the axis or journals of the upper feed rollers in suspended bearings attached to the rods. 2d, Adjusting the cutting cylinder by having its bearings attached to vertical slide rods operated by the bevel wheels and screws, and securing the cylinder at the desired height by means of the clamps and rod. 3d, The employment or use of the guide rod and guide, arranged for the purpose of keeping the adjustable cutter firm and steady while operating, and causing it to be adjusted with facility."

110. For an *Improvement in Spring Curtain Rollers;* Benj. B. Webster, Boston, Mass.

Claim.—"In combination with spring *a* the friction spring *c* or its equivalent, combined with and operated by a cord so as to stop the rolling up of the curtain, or to cause the same to roll, or to hold the same at any point required."

111. For an *Improved Composition for Filling in Fire Proof Safes;* David Weiser, Milwaukie, Wisconsin.

Claim.—"The employment and use of the composition of matter, as a fire proof filling or lining for fire-proof safes, or other rooms, compartments, or places, required to be made fire-proof."

112. For an *Improved Furnace Grate Bar;* Robert Wicks, City of New York.

Claim.—"The construction of the grate bars of furnaces with dove tails, or other analogous interlockments, so as to connect the bars together, keep them from twisting out of place or sliding from the bearing bars, while affording the greatest facility in removing defective and inserting new bars."

113. For a *Machine for Cutting Irregular Forms;* J. S. Barber, Boston, Massachusetts, Assignor to Robert J. Marcher, Blooming Grove, New York.

Claim.—"The machine for turning ovals, consisting essentially of the sliding cutters in combination with the table and pattern."

114. For an *Improvement in Dressing Sewing Thread;* John M. Heck, Assignor to Henry Terry, Plymouth, Connecticut.

Claim.—"The using (or in other words, subjecting the thread to the use, action, and friction) of a series of rapidly revolving brushes, to polish, soften, and dry the thread after having sufficiently saturated with a size or liquid, whereby smoothness, lustre, pliability and strength is imparted to the thread."

115. For a *Mode of Indicating the Numbers of the Yea and Nay Balls in Machines for taking Votes in Legislative Bodies;* Samuel Huffman, Assignor to self and C. D. Hay, Charleston, Illinois.

Claim.—"The use of transparent tubes, or their equivalents, provided with index scales, for the purpose of showing the number of votes on either side of a question by indicating the number of balls which have passed into each tube."

116. For a *Fluid Metre;* John Taggart, Assignor to John Taggart and Julius S. Shailer, Roxbury, Mass.

Claim.—"1st, Two chambers united by a rectangular or square neck or passage made of a width greater than the thickness of the vibrating piston or plate extended through the neck. 2d, An induction pipe or opening in the upper chamber. 3d, Two eduction passages and valves applied to the lower chamber. 4th, A vibrating plate dasher or piston extending from one chamber into another chamber. 5th, A mechanism applied to the eduction valves, whereby they may be alternately opened and closed by the vibrating plate or dasher during its movement."

117. For an *Improvement in Grain Harvesters;* Benj. S. Nicholson, Administrator to the Estate of Jno. F. Nicholson, deceased, Davidsonville, Md.,

Claim.—"Making the space, through which the grain passes, in the form of a rhombus, for the purpose of depositing the grain in a line out of the track of the horse."

118. For an *Improvement in Machinery for Spinning;* Arad Woodworth, 3d, Boston, Massachusetts.

Claim.—"The use of one or more inner flyers arranged in a sequence, one within the other, to revolve in the same or different directions, or at the same or different speeds with the outer flyer, all the flyers acting continuously upon the roving yarns or material first received by the outer flyer, until the spinning or twist is completed and the yarn or yarns are wound upon the spool or bobbin, thereby twisting and spinning more rapidly and attaining any desired degree of twist in yarns."

119. For an *Improvement in Springs for Carriages;* M. G. Hubbard, City of N. Y.

Claim.—"Forming the fulcrum of the springs, by connecting them by a clip and bolt at their crossing point."

MAY 22.

120. For an *Improvement in Wooden Saddle Trees;* Geo. B. Ambler, Trumbull, Conn.

Claim.—"Providing the slot in the centre of the head of a wooden saddle tree and the screw thread in the top strap, said slot serving to receive the end of the gullet hook and the screw thread serving to firmly hold the screw.'

121. For an *Improved Rat Trap;* Lucius B. Bradley, Watertown, Conn.

Claim.—"The employment of a swinging plate and balancing or counteracting spring, in combination with the ordinary spring, drop, or fall."

122. For an *Improvement in Steam Boilers;* Thos. G. Boone, Brooklyn, New York.

Claim.—"The arrangement of the vertical water tubes, fire surfaces, upper and lower water spaces, and non-conducting lining for giving circulation."

123. For an *Improvement in Cotton Gins;* Leonard Campbell, Columbus, Miss.

Claim.—"1st, The combination of the two bush cylinders and brush bar. 2d, The employment or use of the mote board, when constructed of two planes, placed at such angles, or in such a relative position to each other, as shown."

124. For an *Improvement in Seed Planters;* L. W. Colver, Louisville, Kentucky.

Claim.—"Hinging the pieces which support the wheels at the point, B, this being also the point of attachment of the arm, and interposing between the pieces and the arm, a spring, so that said two pieces may radiate from nearly the same centres; said spring tending to hold the wheels into the ground, whilst each one of the series may yield to any irregularities in the ground without affecting the others. Also, the arrangement of the sword or divider, described upon the tube, and projecting it forward in close contact with the flanch on the wheel, so that it may enter the ground with said flanch, and spread and hold upon the furrow for the reception of the seed."

125. For an *Improvement in the Stop Motion of Knitting Machines;* Robt. Cushman, Pawtucket, R. I.

Claim.—"The finger, placed in contact with and resting against the fabric, so arranged that when the fabric is too imperfect to support the finger, it will vibrate and stop the machine. Also, the lever, actuated by the levers and in combination with the rock shaft and the friction clutch, when so arranged and operated that the instant the thread or one of the threads break, the machine is arrested."

126. For an *Improvement in Carriage Wheels;* D. W. Clark and S. H. Gray, Bridgeport, Connecticut.

Claim.—"Having the felloes constructed of malleable cast iron, and having the spokes fitted in mortises in the hub, and in sockets on the inner surfaces of the felloes. Also, the spokes having sockets secured on them at about their centres, in which the inner ends of short oblique spokes are fitted, the outer ends of said spokes being fitted within oblique sockets on the inner surfaces of the felloes."

127. For an *Improvement in Brick Presses;* John Chase, Jr. Pequonock, Conn.

Claim.—"The swinging frame constructed, arranged, and operated for the purpose of feeding the empty moulds to the press boxes and discharging the filled moulds therefrom. Also, the employment or use of the levers or pendents, constructed with projections and placed between the bars of the grates, so that as the filled moulds are forced downward from between the grates and friction rollers, the stones, should any be in the moulds, will act against said projections and turn the pendents, so that a passage or opening is allowed for the stones to drop through."

128. For an *Improvement in Wristbands of Shirts;* Rufus K. Chandler, Richmond, Va.

Claim.—"Making wristbands with double flaps."

129. For a *Stave Machine;* Daniel Drawbaugh, Eberly's Mills, Pennsylvania.

Claim.—"The combination and arrangement of the following parts, to wit: Making the frame to vibrate on the shaft, and hinging it (the frame) to the bed, so as to operate it with a vibrating motion on the pivots and slides with the brace, which renders the bed rigid to traverse parallel so as to cut the lumber either curved or straight as required for staves, heading, or other purposes, the bar being changed or reversed."

130. For an *Improved Warm Air Furnace;* Michael B. Dyott, Philadelphia, Pa.

Claim.—"The arrangement of devices, to wit: the movable fire pot, the air flue and chamber or fire space."

131. For an *Improvement in Sewing Machines;* Chas. A. Durgin, City of New York.

Claim.—"The vibrating hook, for holding down the thread during the partial passage of the shuttle through the loop."

132. For an *Improvement in Umbrellas;* Wright Duryea, City of New York.

Claim.—"Connecting the stretchers to the outer or traversing portions or parts of the ribs, so as to hold the said portions out in their proper positions when the umbrella is spread; and also, that those portions of the ribs to which the stretchers are connected may be traversed by moving the stretchers and slide when the umbrella is closed."

133. For *Improvements in Valve Gear for Oscillating Engines;* Marcus D. DuBois, Newburg, N. Y.

Claim.—"1st, Furnishing the rock shaft by which motion is to be given to the valve or valves with three arms, *c*, *f*, *f'*, arranged so that the arm will be brought by the oscillation of the cylinder into contact with a fixed stud, and thereby be caused to give a movement to the valve to open the ports, and that the arms will alternately be brought by the same means into contact with fixed spring catches for the purpose of giving the valve a movement to close the ports. 2d, Furnishing the rock shaft with two arms, *d*, *d'*, arranged to strike two fixed pieces when necessary to throw the arms *f*, *f'*, into a position to be caught by the spring catches, for the purpose of moving the valve to close the ports."

134. For a *Machine for Cutting Screws on Bedstead Rails;* Henry Gross, Tiffin, Ohio.

Claim.—"The mechanical combination and arrangement of the double V cutter and the manner it is secured in the cylinder head when used by the screw head. Also, the

changes from right to left, by which changes, right and left handed screws are cut with the same cylinder head and double V cutter. Also, the mechanical arrangement and combination of the lever, the wedge and nut blocks, when working together, viz: the blocks being right and left longitudinal sections of female screws, and used to direct the course of the shaft to which the cylinder head is attached, the wedge, by which the nut blocks are changed, and the lever, which guides the blocks and keeps them in their proper place when the change is made. Also, in combination, as above, the double clamp and nut, the screw by which the clamp is opened and closed, and the rest block, for supporting the rail while being cut."

135. For an *Improvement in Fire Arms;* Henry Gross, Tiffin, Ohio.

Claim.—"The combination and arrangement of the cap cylinder with the cylindrical roller."

136. For an *Improvement in Grain Harvesters;* Jonathan Haines, Pekin, Ill.

Claim.—"So hinging the platform to the finger bar and frame as to facilitate the raking, break down the stubble, and leave the gavels in better condition to be gathered by the binders."

137. For an *Improvement in Hullers of Buckwheat;* Chs. B. Horton, Elmira, N. Y.

Claim.—"The arrangement and combination of the fan, with the suction spout, the discharge openings, and the stones."

138. For a *Tree Nail Machine;* J. W. Hoagland, Jersey City, N. J.

Claim.—"1st, The use and employment of the circular plate with its diagonal slots to concentrate or expand the cutters and thus regulate the size of the tree nail. 2d, The use and employment of the followers with its apparatus of band and wheel to govern the gauge, so that the tree nails may be made uniform in size. 3d, The use of the levers and their apparatus of ovals to separate the feed rollers or allow them to approach each other for the purpose of holding the tree nail firmly while it is being enlarged or diminished. 4th, The use of the pattern gauge and the stem, to govern the circular plate."

139. For an *Improvement in Carriage Springs;* M. G. Hubbard, City of New York.

Claim.—"The employment of a bar extending under the carriage, which, by its torsion, acts as a spring."

140. For an *Improvement in Whiffle Trees;* Isaac Krebs, Winchester, Va.

Claim.—"The construction of a whiffle tree with the continuous sliding bolts or trace fastenings, rods, communicating directly with, and attached to one single and the same lever, together with the staple, one single flexible spring, clevis clips, in combination and through all of which are actuated and retained in position simultaneously at one and the same time, the continuous sliding bolts."

141. For an *Improved Carriage for Steam Fire Engines;* A. B. Latta, Cincinnati, Ohio.

Claim.—"The combination of the piston rod, connecting rod, and cranks, with the shaft, couplings, and driving wheels, so that the same power that operates the fire engine, may, at pleasure, operate the driving wheels for the locomotion of the carriage, or leaving them stationary while the engine is performing its duty. Also, connecting the forward guide wheel to the body of the carriage by the large horizontal ring in which it revolves, in combination with the vertical springs and brace springs for supporting the boxes against shocks experienced in running over pavements and other rough places. Also, combining hooks, rests, or other equivalents, with the body of the carriage, to support the suction hose, without detaching them from the induction parts of the pumps."

142. For *Improved Air Heating Cook Stoves;* Chas. B. Loveless, Boston, Mass.

Claim.—"My improved arrangement of one continuous smoke flue around an oven and against hot air flues, whereby not only are the hot air flues and four sides of the oven subjected to exposure to the heat of the smoke while coursing through such continuous flue, but that the end of the oven and the end of the vertical hot air chamber are also exposed to be so heated."

143. For an *Improvement in Farm Gates;* Henry B. Lum, Sandusky, Ohio.

Claim.—"Having the lower ends of the gate secured by pivots or rods to a sill piece, and having a series of strips placed on sleepers or secured in any proper manner on the

ground at one side of the gate, spaces being left between said strips to allow the bars or rods to pass therein, the gate having a weight or counterpoise, one or more, attached to it by a cord or chain which passes over a pulley attached to the post, one or two posts being employed—the gate being operated by the levers with the cords or chains attached thereto."

144. For an *Improvement in Spark Arresters;* David Mathew, Philadelphia, Pa.

Claim.—"The separating head or cone having the surface that is exposed to the current from the chimney, formed of V cavities or projections and openings for the purpose of separating the sparks from the current of gases. Also, the saddle pipe for the purpose of supporting the head and conducting the current of sparks and gases through it."

145. For a *Tool for Grooving Mouldings;* Robt. J. Marcher, Salisbury Mills, N. J.

Claim.—"Forming or cutting transverse and parallel grooves in concave portions of mouldings by means of a tool stock attached to a plate by a pivot which is at the centre of a circle, of which the concave forms a part; the cutter being attached to the lower end of a slide, which is operated or pressed down when the cutter acts upon the moulding by a spring, and elevated upon the return motion of the cutter by raising the lever, the cutter having a stop or guard adjoining it for the purpose of regulating the depth of the cut."

146. For a *Tool for Grooving Mouldings;* Robt. J. Marcher, Salisbury Mills, N. Y.

Claim.—"The reciprocating tool stock, slide, with cutter, one or more, and stopper guard attached to its lower end, and having a spring acting upon its upper end and the slot in the plate."

147. For an *Improvement in Lubricating Compounds;* Jacob Marshall, Reading, Pa.

Claim.—"The combination of whale or other oils mixed with the oleate of zinc, prepared by mixing a solution of soap in water with a solution of acetate of zinc in water, in which the oleate of zinc is separated in a saponaceous mass, while the acetate of soda dissolves in the liquid."

148. For an *Improvement in Sub-Marine Excavating Machines;* Jason C. Osgood, Troy, New York.

Claim.—"1st, The combination of the excavating machinery, the railway track and car, and the well hole deposits of the float or vessel, for the purposes of a self-tending sub-marine excavating boat. 2d, The combination of the drags with the vessel or float."

149. For an *Improvement in Cordage Machinery;* Henry Pearce, Cincinnati, Ohio.

Claim.—"The arrangement of a friction or rubbing collar, operated by a plunger passing upward within the supporting stem, and the weighted lever, or equivalent devices, for regulating the degree of facility of rotation of the bobbin spindles."

150. For an *Improvement in Fences;* J. B. Reyman, Dubuque, Iowa.

Claim.—"The mode of fastening pickets to the rails, in making fences, by means of wire combined and interwoven with the rails. Also, fastening the brace at its upper end to the standard, so as to admit of a hinge motion."

151. For an *Improved apparatus for Drying Grain;* Thos. F. Rowland, Jas. Stevens, and Wm. H. Mason, Brooklyn, New York.

Claim.—"The heating tubes, in combination with the hopper, for partially heating the grain, or other substance, as it passes to the kiln. Also, in combination with the series of perforated or wire gauze shaking pans, the surrounding double metallic casing, the opposite sides of which are connected by horizontal tubes passing under the pans and connected with a steam boiler for the circulation of hot water or steam through the whole casing and connecting tubes, the said double casing being surrounded by masonry; the said combination being for the purpose of more effectually and economically drying grain or other substances without the danger of scorching or overheating it, and to avoid the condensation of the vapors evolved from the grain, or other substance, which, if permitted to take place within the kiln, not only remoistens the grain, but is otherwise injurious. Also, in combination with a kiln consisting of the double casing connected with a steam boiler and surrounding the perforated or wire gauze shaking pans, the employment of a blast of heated air, introduced at the bottom and forced to pass upwards

through the kiln and through the perforations in the pans, and to escape at top, for the purpose of driving off the moisture and vapors evolved from the grain or other substance."

152. For an *Improvement in Sewing Machines;* T. J. W. Robertson, City of N. Y.

Claim.—"So arranging and applying the looper, or its equivalent, by which the loop in the needle thread is extended or directed for the purpose of completing the stitch, that it shall derive its movement from the needle."

153. For an *Improvement in Seed Planters;* Edgar M. Stevens and Jos. B. Crosby, Boston, Mass., and Joseph W. Pearson, Winchester, Mass.

Claim.—"The application of elastic surfaced feed rollers in sewing machines, in connexion with an expanding tubed spreader."

154. For an *Improvement in Ox Yokes;* John Tucker, Norway, Maine.

Claim.—"The blocks in which the bows are set, constructed so as to slide upon the rods, in lieu of having them slide upon the under side of the beam, to prevent injury."

155. For a *Mandrel for Cutting Tapering Sticks;* George Turner, Edinborough, Pa.

Claim.—"The construction of my face plate with the two jaws, with the cutter on one of them, and made to close together by means of the right and left screw shaft, moved by means of the cogged wheel and the screw thread on the rim, or by any other construction which will produce the intended effect."

156. For an *Improvement in Curbs for Water Wheels;* John Tyler, West Lebanon, New Hampshire.

Claim.—"Combining the hinged lip with the curb of a water wheel in such a manner that its inner curved surface forms the termination of the scroll water-way surrounding the wheel, whilst its straight surface forms one side of the mouth of the said scroll water-way."

157. For an *Improved Self-Acting Nipper Block;* Jonathan Whipple, Jr., Milford, Mass.

Claim.—"The construction of the same with the one wheel or pulley combined with a ratchet wheel, pawls and levers, and jaw or nipper."

158. For an *Improvement in Telegraphic Key Apparatus;* Leroy S. White, Chicopee, Mass., and Lewis White, Hartford, Connecticut.

Claim.—"In combination with a sliding key circuit breaker, a friction slider, a metallic bar, and an insulated stop bar, or the equivalent thereof."

159. For an *Improved Method of Opening and Closing Gates, &c.;* Caleb Winegar, Union Springs, N. Y.

Claim.—"The opening and shutting of gates or doors by means of a retentive or reserve power, so that a gate or door may be opened or closed a succession of times; let it be obtained by winding up a spring or weight, or whether gear is used, or cords and pulleys. Also, the application of the wires and the right angular irons or elbows to the opening and shutting gates, &c."

160. For an *Improvement in Spikes;* John Henry Wygant, Hackensack, N. J.

Claim.—"Providing a spike with a bevel or inclined offset on one of its sides, and employing in connexion with the same, a light metal bar or locking piece."

161. For an *Improvement in Bank Locks;* Linus Yale, Newport, New York.

Claim.—"The sliding frame and plate in combination with the rods, when constructed so that the plate will, during the operation of unlocking the lock, cover the opening or key hole in the casing before the bolt can be thrown back, thereby preventing the lock from being picked, or impressions taken to form a key. Also, unlocking the lock by means of a segment key, which is placed within a corresponding shaped recess in the plate, by passing said key through the opening or key hole, and moved with said plate, so that when the bolt is thrown back, the recess and key will be in line with or opposite to the opening in the knob, thereby allowing the key to pass out of the recess through said opening into the hand."

162. For an *Improvement in Knitting Machines;* Jonas B. Aiken, Assignor to Jonas B. Aiken and Herrick Aiken, Franklin, N. H.

Claim.—"1st, The needle latch regulator. 2d, The needle latch regulator in combination with the yarn carrier."

163. For an *Improved Water Metre;* J. S. Barden, New Haven, Conn., Assignor to Oliver Stow and G. B. Farnam, Mendon, Conn.

Claim.—"A cylinder of any given size with a common plunger within it, open at both ends and secured within a case, divided into two compartments, each compartment with their heads acting as heads to the cylinder, and reservoirs to receive the sediment either drawn in and not thrown out, or that which may be deposited from the water. 2d, The reservoir for the collection of sediment, whether connected with a cylindrical or a rotary water metre. 3d, The mode of moving and throwing the valve. 4th, The casting or turning of a groove upon the circumference of a piston plate and around its entire diameter, with holes drilled from the base of the same through on the inside. And, lastly, I claim the entire combination."

164. For an *Improvement in Screw Wrenches;* Francis S. Coburn, Ipswich, Mass., Assignor to Ruggles, Nourse, Mason, and Co., Worcester, Mass.

Claim.—"Arranging and combining with the angular recessed head of a handle, a movable notched jaw, operated in manner with respect to the recess of the head, rendering the wrench adjustable to nuts or screw heads of different sizes, and capable at the same time of embracing them on their four sides."

165. For an *Improvement in Burning Fluids;* Abraham Gesner, Williamsburg, N. Y., Assignor to "The Asphalte Mining and Kerosene Gas Company," Assignors to said Gesner, and by said Gesner, to "The North American Kerosene Gas Light Company."

Claim.—"The burning fluid, composed of alcohol and A. kerosene."

166. For an *Improvement in Hose Couplings;* Lucien E. Hicks, Assignor to self and Geo. N. Davis, Boston, Mass.

Claim.—"Combining the two parts or halves of the coupling by means of a locking or bayonet connexion, or the equivalent therefor, and an elastic tube, possessing sufficient elasticity, not only to form, by its expansive power when compressed, a joint under pressure of a liquid within the hose, but to maintain the locking connexions in place when their catch stud is in its recess. Also, making the bearing shoulder conical, or so as to cause the circumference of the tube to be borne against the cylinder seat by the expansive power of the tube acting against such conical part, the same being not only to give support to the tube, but to aid in maintaining a close joint against the pressure of the fluid in such tube. Also, the shoulder tube as combined with the elastic packing tube and one part or half, and used for the purpose of supporting the tube."

167. For an *Improved Swell for Melodeons, &c.;* Thomas F. Thornton, Assignor to George A. Prince and Thos. Stephenson, Buffalo, N. Y.

Claim.—"The divided swell constructed so that one-half (or part) may be used separately when desired for producing more variety in the tone of reed instruments, such as melodeons, melopeans, seraphines, and reed organs, all of which are very similar in construction."

168. For an *Improvement in Sewing Machines;* Joseph Bond, Jr., Philadelphia, Pa.

Claim.—"1st, The spool case with teeth, or their equivalents, on its outer edge, and the nose for catching the needle thread, in combination with the wheel having teeth cut away. 2d, The hollow spool case with its spool in combination with the radiating arm, or its equivalent. 3d, The auxiliary lever as operated by cams on the driving shaft (not for the purpose of controlling the needle thread between the eye of the needle and the goods, as in Harris' and Howes' Machines, nor for the purpose of tightening the stitch as this is done by the needle bar, but) in conjunction with the spool case, so as to accommodate the needle thread as it passes over the spool case, thereby diminishing the extent of movement required in the needles of other machines."

MAY 29.

169. For an *Improvement in Invalid Bedsteads;* Thos. Arnold, Mobile, Alabama.

Claim.—"Forming the main frame or bottom of the bedstead in three parts, the middle part being stationary, and the head part rendered capable of being elevated, and the foot part depressed."

170. For an *Improvement in the Shuttle Motion of Looms;* John Avery, Lowell, Mass.

Claim.—"The hanging of a staff upon a fixed pin or centre, and so vibrating it in regard to the shuttle as that the shuttle shall take its forward motion from the picker staff always with its heel on the rise and its point dipped towards the shed."

171. For an *Improvement in Cartridges;* Charles F. Brown, Warren, R. I.

Claim.—"1st, Making the ends of the metal cartridge case of hemispherical or other convex form. 2d, Providing a water chamber in the rear end of the cartridge case, to be filled with water previously to the insertion of the cartridge in the gun."

172. For an *Improvement in Gas Regulators;* Saml. W. Brown, Lowell, Mass.

Claim.—"The tip valve in combination with the movable top or float of the regulator for operating the tip valve by means of the projections. Also, the use and application of oil and water, or other liquid on which oil will float, for the packing required in my gas regulator."

173. For an *Improvement in Invalid Bedsteads;* E. Daniels, Union, N. Y.

Claim.—"The combination of the body plane, thigh planes formed of two parts, one of the parts being movable, and leg planes, provided with adjustable bars, the movable parts of the thigh planes and the bars of the leg planes being operated by the racks and pinions."

174. For an *Improved Machine for Making Paper Bags;* E. W. Goodale, Clinton, Mass.

Claim.—"1st, Giving the blades of the side shears a curved angular or irregular form, near the point, for the purpose of cutting out each by a single cut, the whole piece necessary to leave the lap on that side of the bag. 2d, Hanging the movable blades of the side shears on shafts or pivots, perpendicular to their faces, for the purpose of allowing them to cut slightly across the fixed blades by a slight lateral movement which they receive simultaneously with the movement usually given to shears. 3d, The intermittently rotating folder, arranged and operating to receive the bag pieces from the feed apron after the cutting and pasting operations, and to support or partly support them until the creasers come into their operative positions, and afterwards to fold them over the creasers. 4th, The combination of the side lappers, and the laterally moving folding stands, operating in conjunction with the creasers. 5th, The toothed roller hung in a frame from the axle of one of the pressing and delivery rollers, and operating to commence the removal of the bags from the creasers. 6th, The general arrangement and combination of the several working parts of the machine."

175. For an *Improvement in Hub and Axle Fastening;* John Henderson, Horseheads, New York.

Claim.—"The peculiar form of the frustrum box fastening."

176. For an *Improvement in Vapor Engines;* Wm. W. Hubbell and David Matthew, Philadelphia, Pennsylvania.

Claim.—"The combination of the distributing perforated pipe or plate, the safety feed pump governed by the pressure and the condenser, or its equivalent, to produce an uniform supply, evaporation, and condensation, or return of the fluid."

177. For an *Improvement in Processes for Treating Auriferous and Argentiferous Sulphurets;* Homer Holland, Westfield, Mass.

Claim.—"The substitution of nitrate of soda, as an improved agent over common nitre for oxidizing the sulphur, for reasons given setting forth the difference."

178. For an *Improved Water Wheel;* Dean S. Howard, Lyonsdale, N. Y.

Claim.—"The combination of the curved sides and twisted buckets, whereby the water is discharged at or about a right angle with its course in the scroll on entering

the wheel when the pressure of the water is applied to the convex side of the bucket, the wheel revolving in the same direction that the water passes through the scroll."

179. For a *Fluid Faucet;* Joseph Hollely, Brooklyn, N. Y.

Claim.—"The eccentric barrel having an elastic packing on it, acted upon by an eccentric key. Also, facing the rubber packing with metal in combination with the above."

180. For an *Improvement in the Construction of Ear Trumpets;* Edward G. Hyde, Camptown, N. J.

Claim.—"The artificial ear, applied to an acoustic auricle or ear trumpet."

181. For an *Improvement in Swing Bridges;* John A. King, Murray, N. Y.

Claim.—"The combination and arrangement of the springs with the bridge, so that the opening and closing of the bridge shall become automatic, and shall not require the attendance of hands to open or close it, as is usual."

182. For an *Improvement in Cider Mills;* T. J. Kindleberger, Springfield, Ohio.

Claim.—"So arranging the scraper in connexion with the roller, that it shall perform its office without injury to the edge of the knives by means of the cam, for preparing the fruit for the crushing rollers in combination with the apple tilter."

183. For an *Improved Apparatus for Paging Books;* Gabriel Leverich, Wellsburg, N. Y.

Claim.—"The adjustable platforms in combination with the type wheels."

184. For an *Improvement in Buoyant Propellers;* Wm. Lansdell, Memphis, Tenn.

Claim.—"The combination of the hollow threads with the central and lateral water spaces, forming the threads of a screw and securing both flotation and propulsion. Also, the use of the flanch arranged on the regular edge of the segments, having the true pitch of the regular screw. Also, the peculiar wedge-like form of the ends of the segments, having the effect to diminish the resistance of the immersed section of the head while it increases the propelling force at the stem."

185. For an *Improved Mitre Machine;* George W. Labaw, Jersey City, N. Jersey.

Claim.—"The combination and arrangement of the several specific parts (or their equivalents) of the mitre and cutting machine."

186. For an *Improvement in Door Locks;* Wm. Maurer, City of New York.

Claim.—"The arrangement of the notched annular plates, segment tumblers, spring pawl, and band on the casing of the lock and segment bars, for the purpose of connecting and disconnecting the band from the casing and allowing the bolt of the lock to be operated and secured."

187. For an *Improvement in Seed Planters;* Thos. S. Minnis, Meadville, Penn.

Claim.—"The wheel with the sliding or expanding elevators through its side in combination with the lifting box and the spout."

188. For an *Improved Shoe for Grain Mills;* Henry Mellish, Walpole, N. H.

Claim.—"The separating shoe for grain mills, having an inclined barrier, arranged and operating below the screw."

189. For an *Improvement in Pill Making Machines;* Erasmus A. Pond, Rutland, Vt.

Claim.—"The hollow working cylinder with a stationary cylinder inside and eccentric to it, the pits on the outside cylinders being perforated, and the perforations supplied with wires bent, with a ring around the loops, so that the wires are thrust out and drawn in, as the working cylinders revolve."

190. For *Improvements in Forging Machines;* Silas S. Putnam, Boston, Mass.

Claim.—"So combining four hammers together, that not only may two of them be approaching towards while the other two are receding from one another, but that the momentum of the receding hammers may be brought into action upon the approaching hammers, so as to increase the effect of the blow or blows produced by them. Also, two hammers arranged to operate on two opposite sides of a bar, in combination with two hammers arranged to operate upon the other two opposite sides of such bar, each set operating alternately, and the four hammers acting on the four sides and producing an equality of reduction of the bar which cannot be obtained by an anvil (to support it,)

and three hammers operating upon the three unsupplied sides of such bar. Also, the manner of constructing each of the connecting rods, in order that it may not only allow its crank to continue its movement when the hammers strike together or upon a bar of metal, but relieve the cranks and connecting rods from the effects of the sudden blows given by the hammers."

191. For an *Improved Grass Harvester;* Francis Peabody, Salem, Mass.

Claim.—"Placing the horses at the side of the driving wheel, when the cutters are placed in front thereof. Also, the mould board in combination with the device employed for the purpose of vibrating the cutter bar, when this device is placed immediately behind the mould board and is connected with the cutter bar by attachments either to the centre or to both ends of the same, whereby a steadier motion of the cutter bar is produced, and the parts which transmit the motion from the driving wheel thereto are covered and protected from being clogged by the grass. Also, the spring regulator constructed and operating for the purpose of adjusting the distance of the knives from the ground."

192. For an *Improvement in Lubricating Compound;* E. F. Prentiss, Philadelphia, Pa.

Claim.—"The manufacture or preparation of a compound which I denominated wool oil."

193. For an *Improvement in Uterine Supporters;* Henry A. Rosenthal, City of N. Y.

Claim.—"The uterine supporter composed of the two supporting leaves and the double shank combined."

194. For an *Improvement in Cut-off Valves;* David Stoddardt, Cincinnati, Ohio.

Claim.—"So arranging the disk connected with the cut-off valve, and in relation to the space below the disk, connecting it by a passage to the cylinder, that the cut-off valve will be operated by steam from the cylinder."

195. For an *Improvement in Grate Bars for Furnaces;* Jacob C. Schlough, Easton, Pa

Claim.—"The mode of constructing grate bars for furnaces, with any convenient number of square or oblong tenons on one side, and a corresponding number of similar shaped mortises on the opposite side."

196. For an *Improvement in Reefing Topsails;* Webster Shibles, Assignor to self and Edward O'Brien, Thomaston, Me.

Claim.—"Combining a windlass yard with the upper topsail yard, and applying the windlass ropes to the outer ends of the windlass yard, and to the topsailyard and topmast, whereby, when the upper topsailyard is lowered, the sail will be furled, and when raised, unfurled."

197. For an *Improvement in Sewing Machines;* Isaac M. Singer, City of New York.

Claim.—"Suspending the feed motion for the purpose of causing the needle to perform two successive operations in one and the same puncture to tie the seam. Also, connecting the pressure pad with its side, or the equivalent thereof, by means of a long jointed arm in combination with the feed wheel, or its equivalent, so that the said pressure pad shall move with the cloth or other substance when fed forward for spacing the stitches instead of making friction, which would tend to pucker or wrinkle such cloth or other substance, and by which, also, the cloth is relieved from pressure after the needle has entered, so that it can be turned freely on the needle as an axis."

198. For an *Improvement in Looms;* Danl. W. Snell, Woonsocket, R. I.

Claim.—"In combination with the yarn beam and mechanism for producing rotary motion of it, mechanism made to operate, and governed in its action by the varying diameter of the yarn beam itself, the same producing upon the yarn beam a positive let-off or regular delivery movement that is independent of, or not governed or controlled either by any positive take-up mechanism, or any mechanism to regulate the delivery of the warps by tension, and rigidly hold them when the lay beats up against the weft."

199. For an *Improvement in Machines for Helically Creasing Sheet Metal Pipes;* Alfred B. Seymour, Claverack, N. Y.

Claim.—"The plate (having a gauge) between the shafts of the creasing rollers, and adjusted by a set screw, so that the proper inclination may be given to the end of the pipe."

200. For an *Improvement in Chairs for Dentists' use;* Richard A. Stratton, Philadelphia, Pennsylvania.

Claim.—"As a new and simple arrangement for raising and lowering and steadying the seats of operating chairs, the annular piece, with its projecting pins and rollers, or their equivalents, in combination with the slotted screw, its nut, wheel, and bracket."

201. For an *Improvement in Grain Drills;* Chapin Street, Barre Centre, N. Y.

Claim.—"The seed distributor with its seed chambers and dust boxes in combination with the cam wheel, spring, and adjusting screws. Also, the peculiar arrangement and connexion with the sliding cam; the lifting board, conductors, and drills."

202. For an *Improvement in Straw Cutters;* Francis Fitzpatrick, Cincinnati, O.

Claim.—"Arranging the rock shaft on which the arms and knife are so placed as to give "a draw cut" in front of the straw box and distant therefrom, so that the tendency of the knife to push away from or leave the straw, shall be resisted or met by the ends of the arms in a line parallel to the thrust, and thus be held up to the straw, whilst the mouth of the straw box is unencumbered by any machinery to prevent the feeding up of the uncut, or delivery of the cut straw."

203. For an *Improvement in Pin Sticking Machines;* J. B. Terry, Hartford, Conn.

Claim.—"Measuring off or gauging the paper to the required unequal distances between the rows of pins, and carrying it forwards to be struck "by means of the feed adjusting ratchet cam operating in connexion with the crimping jaws, or the equivalents of such devices and their operative gear, so that the crimping jaws have their reciprocating intermittent feed or travel regulated to gradually increase for a certain number of feeds, and *vice versa*, that is, the advance action of the crimping jaws made sooner or later, and shorter or longer, without varying their advance terminus to measure out the paper into rows or crimps of gradually increasing distance from either end of the stuck sheet, to secure the flat close wrap of the sheet from its ends towards the centre. Also, in connexion with the forceps, or their equivalents, for taking the crimped paper from the crimper, the double clamps or jaws for holding the crimped paper while the pins are being stuck. Also, the employment of the intermittent revolving cylinder, formed on or round its periphery with rows of parallel grooves of the width of the body of the pin, and corresponding with the grooves in the conductor and arranged in relation thereto as specified, and of the length of a pin or thereabouts, with a notch or recess at the back and for the head of the pin, each groove serving to count out and convey one pin at a time, and the whole serving to count out and convey to their horizontal sticking position the several pins in a row. Also, the manner of operating the distributing cylinder by means of the vibrating arm, operated from an intermittent rock shaft, and having a spring ratchet biting into a toothed disk, or the equivalent of these devices, to give to the cylinder its counting out and conveying action. Also, the employment of a striker arranged at the foot of the conductor, and operating to strike the pin at or near its point, as the pin leaves the conductor to change the position of the pin, and hold it to its seat in the distributing cylinder. Lastly, forming the inclined conductor at its lower end with an off-set covered by an apron, having recesses on its upper edge to allow of the heads of the pins passing there-through, and having a guide on its outer face to carry off the surplus pins."

204. *For an Improvement in Whiffle Trees;* Harvey Webster and Alonzo Webster, Mountpelier, Vt.

Claim.—"The arrangement and combination of the movable spring clamp, its cast-off, its spring latch, and the stationary pin or holder, the whole being applied to each end of the whiffle tree."

205. For an *Improved Corn Grinder and Crusher;* Wm. D. Wilson, Richmond, Ia.

Claim.—"The general arrangement and combination of the crushing rollers, grinding roller, adjustable concave, platform, and gearing."

206. For an *Improvement in Preparing Wood for Paper Pulp;* Milton D. Whipple, Charlestown, Mass.

Claim.—"Grinding the block upon the surface of a revolving stone, or its equivalent. Also, maintaining the block in such position with respect to the stone that the fibres of the wood shall lie in the direction of motion of the stone, or very nearly so. Also, rotating the block during the operation of grinding."

207. For an *Improvement in Vehicles;* E. D. Williams, Wilmington, Del.

Claim.—"The combination of the plate springs and the spiral springs connected or attached to the floor of the body of the vehicle and the perch, and using, in connexion with said springs, the straps for the purpose of preventing sudden longitudinal and lateral vibrations."

208. For an *Improvement in Mowing Machines;* Courtland Wilson and Wm. Moore, Jr., Yardleyville, Pa.

Claim.—"The application of the spring prongs or jaws, and clamp."

209. For an *Improvement in Looms;* Joseph Welsh, Philadelphia, Penn.

Claim.—"Actuating the picker stopper by means of the shuttle, which is to be relieved from the picker, and so that the tip or point of the same may be finally relieved, before the box containing it commences to move, or by means of the stud in combination with the rock shaft, or its equivalent, adjustable arm, and moving stud, irrespective of the action of the shuttle upon the swell."

210. For a *Machine for Making Paper Bags;* Francis Wolle, Bethlehem, Penn.

Claim.—"1st, The conveyor for conveying the folded paper to the apron, by which it is carried to the folding and lapping apparatus. 2d, The construction of the lappers, and their connexion with their respective lapping tables. 3d, The arrangement of the drying chamber and the aprons which convey the bags through it, so that the bags are severally delivered to the aprons with their sides in a position oblique to the direction in which the aprons move, and thus, as they are successively deposited, have the wet laps of their sides and ends left uncovered by their successors. 4th, The general arrangement and construction of the whole of the machinery, whereby a piece of paper of suitable length is cut from a roll, cut out to the proper shape, folded, pasted, lapped, printed in any desirable manner, and dried, at one continuous operation.

211. For an *Improvement in De-Vulcanizing India Rubber;* Segismund Beer, Assignor to Lewis Feuchtwanger and Segismund Beer, City of New York.

Claim.—"The restoration of caoutchouc, gutta percha, or other similar gums which have undergone the process of being cured or vulcanized, so that those gums may be capable of being used again as a substitute for native gums of like character or in combination with such gums, by first treating the vulcanized gum with alkalies, or compounds of alkalies and oils (as potash with any common grease or oil) for extracting the sulphine, &c., and then submitting the mass to the action of heat, and turpentine, or any other liquid known to be a solvent of the gum in its natural condition."

212. For an *Improvement in Sewing Machines;* Addison Capron, Assignor to self, Joseph S. Dennis, Somerville, Mass., and Henry M. Richards, Attlebero', Mass.

Claim.—"Combining the needle with the main carrier by means of a secondary carrier and a spring, or the equivalent thereof, applied to the main carrier."

213. For *Improvements in Hand Pegging Machines;* Alfred Swingle, Assignor to Elmer Townsend, Boston, Mass.

Claim.—"So combining the peg chisel or cutter with the spring slider and the peg receiving and discharging passage thereof, that such peg cutter shall be moved upwards with and by the slider, so as to separate a peg from a strip of peg wood, the same rendering it unnecessary to employ a spring bottom to the magazine, as is required when the peg wood is moved against the knife. Also, the manner of applying the spring to the peg wood driver and magazine, viz: by employing an elastic band spring, fastening it at its two ends to the magazine and the driver respectively, and making it to play around a grooved pulley applied to the handle or magazine."

214. For an *Improvement in Pads for Hernial Trusses;* Lucien E. Hicks, Boston, Mass., Assignor to self and Hiram L. Hall, Beverly, Mass.

Claim.—"1st, An india rubber pneumatic truss-pad without opening or valve, and filled with compressed air. 2d, Making the top of the pad thicker than the bottom or cushion, whereby the former is rendered sufficiently rigid to allow of the attachment of

the shank, while the cushion maintains its entire elasticity. 3d, Sinking the button beneath the surface of the pad within the cavity and securing it therein by the flanch, by which means the button is surrounded by the annular cushion, and is prevented from coming in contact with the person."

215. For *Improvements in Burning Fluid Compounds;* Abraham Gesner, Williamsburgh, N. Y., Assignor to "The Asphate Mining and Kerosene Gas Company," re-assignors to said Gesner, and by him assigned to "The North American Kerosene Gas Light Company."

Claim.—"As a new manufacture, or composition of matter, I claim the burning fluid composed of alcohol, and B. kerosene."

216. For an *Improvement in Amalgamating the Precious Metals;* Leander R. Streeter, Assignor to self and Ira Leonard, Lowell, Mass.

Claim.—"Forcing mercury at any required degree of pressure into ores to be amalgamated, when the ores are enclosed in a mercury tight cylinder or receiver."

ADDITIONAL IMPROVEMENTS.

1. For an *Improved Mode of Regulating the Furnace of Hot Water Apparatus;* Thos. T. Tasker, Philadelphia, Pennsylvania; dated May 8, 1855; original patent dated December 5th, 1854.

Claim.—"The arrangement of the three dampers or valves, and their several connecting rods, in combination with a single float placed in the open tank above."

2. For an *Improved Machine for Sawing and Planing Clapboards;* Ephraim Parker, Rock Island, Illinois; dated May 15th, 1855; original patent dated Dec. 20th, 1853.

Claim.—"The peculiar mode of hanging the front cutter or plane, or its equivalent. Also, the manner of hanging the saw, or its equivalent, so that they will adapt themselves to the different thickness of boards. Also, in combination, or either one when operating seperately."

3. For *Improvements in Machinery for Crushing Quartz, &c.;* James Hamilton, City of New York; dated May 22d, 1855; original patent dated January 3d, 1854.

Claim.—"The combination of the weighted levers and adjusting screws with the pestle, set and moving on the shaft."

RE-ISSUES FOR MAY, 1855.

1. For *Improvements in Machinery for Reducing Metal Bars;* Dexter H. Chamberlain, Assignor to Cyrus G. Howard, Boston, Mass., Assignor to Peter Cooper, City of New York; dated May 15th, 1855; original patent dated January 18th, 1853.

Claim.— The method of rolling bars or rods on four sides by the combination of three rollers arranged with the axes of two of them parallel and the third at right angles thereto, whereby two opposite faces of the bar or rod are drawn between the two rollers on parallel axis, and the other two faces between the periphery of the third roller and the face of a cavity formed in one or both of the other rollers. Also, in combination with the three rollers combined and arranged, the employment of the bolster to prevent the forming of a fin on the bar at the junction of the two parallel rollers."

2. For an *Improvement in Endless Chain Horse Power;* Alexander F. Wheeler, Ex'r of Wm. C. Wheeler, dec'd, and Alonzo Wheeler, Albany, New York; patent dated May 22d, 1855; original patent dated July 8th, 1841.

Claim.—"The links of the parallel endless chains which carry the traveling bed, formed with cogs on their inner edge meshing into the side pinions on the driving shaft, when the latter is arranged back of the forward end of the power to receive motion by the straight run of the cog links over the said pinions."

3. For an *Improvement in Bleaching Apparatus;* Charles T. Appleton, Roxbury Mass., patent dated May 22d, 1855; original patent dated April 17th, 1855.

Claim.— The combination of one or more air-tight vats for receiving and containing the goods, an apparatus for exhausting the air therefrom, and the necessary vessels for containing the liquids used in the process of bleaching, whereby the various steps may be performed in a much shorter space of time than has heretofore been required."

DESIGNS FOR MAY, 1855.

1. For *Cooking Stoves;* Benj. Wardwell, E. R. Barstow, and G. C. Harkness, Providence, Rhode Island; dated May 8th, 1855.

Claim.—"The ornamental design and configuration of the side of the stove, inclusive of its base and cornice mouldings. Also, the ornamental design of the larger door, and that of each of the doors. Also, the ornamental design of each door, that of the hearth plate, and that of each of the legs."

2. For *Equestrian Statues;* Clark Mills, Washington D. C.; dated May 15th, 1855.

"The nature of my design relates to an equestrian statue in which the horse is rampant, and so poised as to be supported on his hind legs only, and mounted by a rider."

Claim.—"The design for an equestrian statue."

3. For *Water Coolers;* George Hodgetts, City of New York; dated May 22d, 1855.

Claim.—"The design and configuration of the parts forming a water cooler."

4. For *Cooking Stoves;* Samuel D. Vose, Albany, N. Y.; dated May 29th, 1855; ante dated April 9th, 1855.

Claim.—"The arrangement and combination of the several figures and mouldings, the whole forming an ornamental design."

5. For a *Cooking Stove;* Samuel D. Vose, Albany N. Y.; dated May 29th, 1855; ante dated April 9th, 1855.

Claim.—"The arrangement and combination of the several figures and mouldings, the whole forming an ornamental design."

6. For *Cooking Stoves;* Samuel D. Vose, Albany N. Y.; dated May 29th, 1855; ante dated April 9th, 1855.

Claim.—"The arrangement and combination of the several figures and mouldings, the whole forming an ornamental design."

7. For a *Parlor Stove;* Samuel D. Vose, Albany, N. Y.; dated May 29th, 1855; ante dated April 9th, 1855.

Claim.—"The arrangement and combination of the several figures and mouldings, the whole forming an ornamental design."

8. For *Sewing Birds;* John North, Middletown, Conn.; dated May 29th, 1855.

Claim.—"The design for sewing bird."

9. For *Parlor Stoves;* Abner J. Blanchard, Assignor to Blanchard, Tarbell & Co., South Reading, Mass.; dated May 29th, 1855.

Claim.—"The composition of mouldings and the ornaments in relief, on the front plate, base plate, and cornice or top plate; and, also, the peculiar design or configuration of the urn, and that of each of the blowers."

10. For *Cooking Stoves;* Abner J. Blanchard, Assignor to Blanchard, Whittemore, & Co., South Reading, Mass.; dated May 29th, 1855.

Claim.—"The design of each of the doors, that of the side plate, the larger hearth plate, and the leg."

J. FOUSER'S APPARATUS FOR REMOVING AND REPLACING THE WHEELS OF LOCOMOTIVES CARS &c.

FIG. 1.

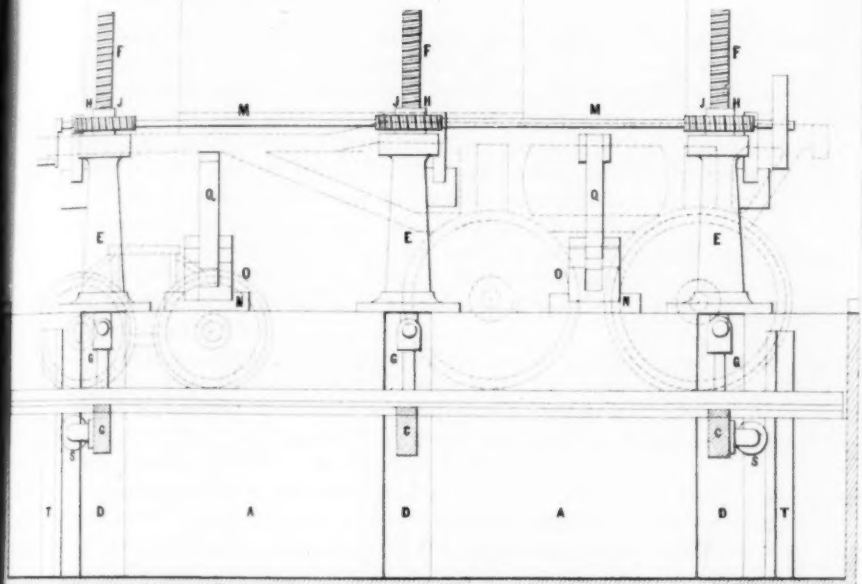
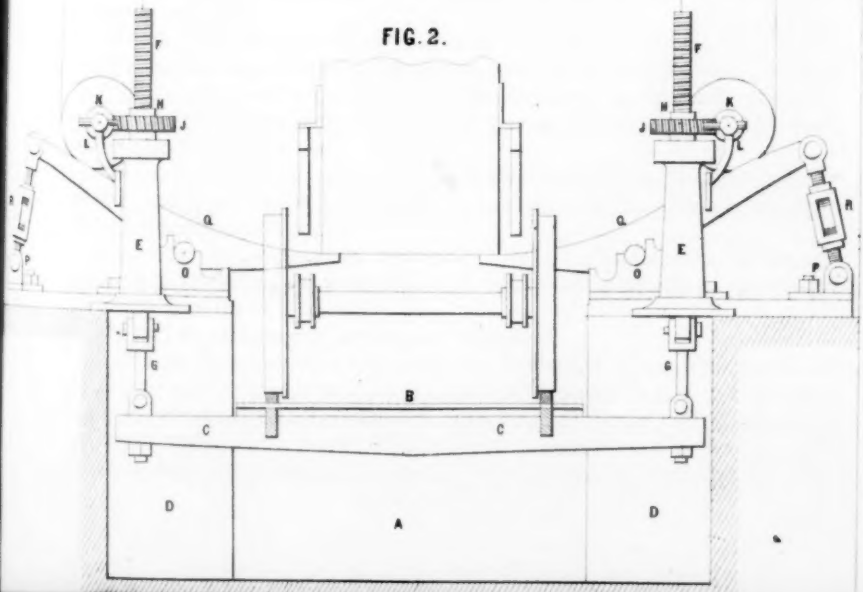


FIG. 2.



MECHANICS, PHYSICS, AND CHEMISTRY.

For the Journal of the Franklin Institute.

Description of Apparatus for Removing and Replacing the Wheels of Locomotives and Cars. Invented by JOHN FOUSER of Philadelphia. By H. HOWSON, Civ. Eng.

One of the greatest inconveniences attending the repairing of locomotive engines and cars, is the fact, that those parts which through wear and tear are most liable to get out of order, are the most difficult of access.

The continual necessity of examining and renewing the axles and bearings as they become worn or otherwise deteriorated, forms no small item in the expenditures of railroad companies, and the preparatory and tedious process of removing the axles, in addition to the material and workmanship, conduces to render such repairs most costly.

This will be apparent when we recollect, that to remove and replace the wheels and axles of an ordinary eight-wheeled locomotive by the use of common screw-jacks is, at a moderate calculation, the combined work of four men for ten hours.

It is true, that in some instances the use of ponderous cranes for raising the entire superstructure from the axles has been resorted to, and on some of the lines in France, extensive and complicated arrangements of movable platforms, operated by racks and gearing, have been brought into practice to effect the required removal.

Throughout the numerous railways in this country, however, the old fashioned screw-jack is still the favorite implement for effecting the abovementioned purposes; and it is somewhat singular, that an instrument so slow in its operations and tedious to manage, has not, ere this, been replaced by more rapid and tractable appliances.

The annexed engraving (Plate IV,) represents two views of Mr. Fouser's apparatus for removing and replacing the wheels and axles of locomotives and cars.

The inventor is a practical machinist, and his experience both in the workshop and on railroads, has shown him the many difficulties attending the repairing of locomotives, and has induced him to design a simple and efficacious arrangement, by which the most important of these difficulties may be overcome.

Measures have been taken to secure the invention by patents, both in this country and abroad, and active preparations are being made to bring it into actual operation.

Fig. 1, in the engraving, represents a longitudinal section of the apparatus in question, showing the truck and driving wheels as in the act of being removed.

Fig. 2, is a transverse section of the same.

A is a pit in a line with the rails of a track in a locomotive repairing shop; in some cases it may be situated on the main line. B is a platform with longitudinal rails corresponding in width of gauge with those of the adjacent track. The platform is nearly of the same size as the pit, sufficient spaces being left between the sides of the pit and edges of the

platform to allow the latter to be raised and lowered within the former, without coming in contact.

Underneath the platform are strong cross pieces or beams, C, the ends of which project into recesses D, left in the sides of the pit. E are cast iron columns on the edge of the pit, and secured to the masonry or brick-work immediately above the recesses, D. Through these columns pass the screws F, which are connected to the ends of the cross-pieces, C, by means of the jointed rods G. H are the nuts, which have flanches at their lower ends, confined by means of caps within the tops of the columns in such a manner that the nuts may turn freely without the possibility of moving vertically. To the nuts H, and above the columns, are screwed the worm-wheels J, and gearing into these are the worms, K, on the horizontal shafts M, which have their bearings on brackets, L, secured to projections on the columns.

To the masonry on each side of the pit and between the columns, are secured the plates N, having flanches, which confine laterally the adjustable blocks, O and P. Both these blocks are arranged so as to be easily moved backwards and forwards and rendered stationary at the position required, by ordinary bolts.

It will be observed that the blocks, O, have three sets of bearings, into either of which may be placed the pins which form the fulcrums of the levers Q, the long arms of the latter being connected to the sliding blocks P, by means of the adjustable rods R.

S S are flanched rollers hung on brackets secured to the sides of the cross-pieces C, and bearing against the rails T, on the sides of the pit, so as to serve as guides for the platform when in the act of being raised or lowered.

Previous to the apparatus being brought into operation, the platform is raised to a level with the ground, so that the rails on the platform and track correspond. Should it be necessary to remove the driving wheels only, that portion of the locomotive to which they are attached, is moved over the platform, the other portion remaining on the permanent track.

The levers Q are now adjusted, so that the points may bear against the under edge of the fire-box, as shown in Fig. 2, or under some portion of the frame-work, and the axles being disconnected, the platform is lowered, and with it the wheels and axles, by turning the shafts M. When sufficiently low, the wheels are rolled to the end of the platform, and clear of the engine, when they are again raised by turning the shafts, M, in a contrary direction, until they are again on a level with the permanent track, along which they may be moved to any distance required. A supplementary truck may now be placed under the fire-box and the engine removed away altogether, or placed above the platform, so that the other wheels may be removed. It is the intention of the inventor, however, in central localities, to make the pit and platform so much longer than the locomotive, that the whole of the wheels may be removed at one raising and lowering of the platform.

It will be seen, that the levers Q can, through the sliding boxes P and Q, and adjusting screw R, be regulated to suit almost any difference which may occur in the construction of the engines.

It is occasionally requisite in replacing the wheels and axles, that one

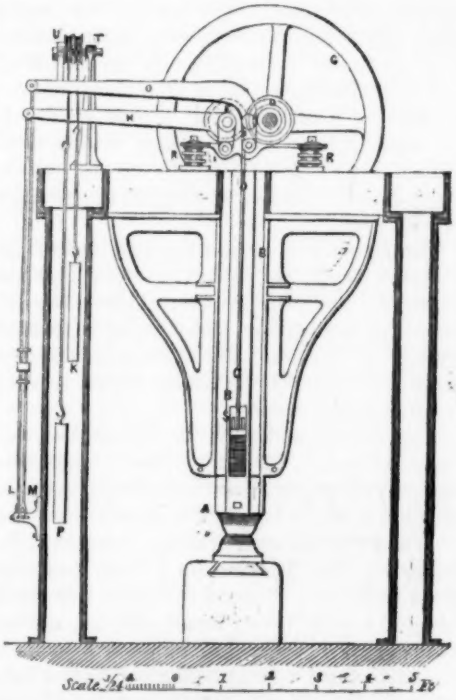
wheel should be raised higher than the other. By Fouser's apparatus, this can be easily done by turning one of the shafts, M, while the other remains stationary; thus giving an inclination to the platform, which, on account of the jointed rods G, in no way affects the proper working of the screws F.

In repairing shops, power may easily be applied to the shafts M, by straps passing upwards and crossed overhead so as to clear the chimney.

By the use of his contrivance, the inventor calculates to be able to remove the wheels and axles of an eight-wheeled locomotive in less than an hour, two men only being required to assist in the operation.

On an Improved Friction Hammer. By JAMES KITSON, Leeds.*

The hammer represented in our engraving has been in use for some time at the author's works, Leeds, where it was originally constructed as a simple and inexpensive hammer, for the heavier smiths' work; and the present description has been prepared only in compliance to a request to communicate to the Institution the particulars of this hammer, as possessing some practical advantages of efficiency and simplicity.



The hammer block A, weighing 5 cwt., is guided by grooves in the same, BB, and is lifted by the flat wrought iron friction bar CC, 5½ inches wide, and ⅝-inch thick, fixed into it by a T head, with two cutters, SS.

The friction bar C, is raised by two rollers D and E, carried on the cross frame at top, one of which D, runs loose on its axle, and the other E, is fixed on a shaft which is driven continuously by a pulley, and carries a fly-wheel GG, at each end, to give momentum for lifting the hammer.

The axle of the roller D, is carried by a bent lever H, which works on a fixed centre I, below the roller, and has a chain connected to the outer end, passing over a pulley T, and attached to the weight K. This weight presses the tightening roller D, towards the driving roller E, and grips the friction bar C, between them, causing the hammer to be drawn up

*From the Lond. Civ. Eng. and Arch's. Jour. February, 1855.

rapidly; the hammer being prevented from being lifted too high by a timber stop at the top of the frame.

A handle L, is connected by a rod to the extreme end of the lever H, and by pressing down this handle, the tightening roller D, is drawn back slightly, releasing the friction bar C, and allowing the hammer to fall. On releasing the handle L, from the pressure, the hammer is again lifted by the bar being gripped between the rollers, and it is again let fall from any height desired by pressing down the handle.

The man holding the handle has thus complete control over the hammer, by simply pressing down the handle, or letting it rise again; and he can readily regulate the rapidity, or length of the stroke, as required. The present hammer makes from 25 to 30 strokes per minute, when lifted to the full height, 5 feet; about 40 per minute with a stroke of 2 feet, and 84 per minute with 14 inches length of stroke. The driving pulley makes 132 revolutions per minute, when the hammer is at work.

The second handle M, works a friction clip or break N, serving to check the hammer, and hold it fast in any position. This brake N, is fixed at the end of a second bent lever O, working on a centre below, and lifted by a chain U, and a second weight P, working by the side of the other weight, inside one of the hollow columns of the framing. This weight presses the brake towards the tightening roller D, the lifting bar being gripped between them by the opposing pressure of the two weights, holding up the hammer in any position that it may be in.

The brake handle M, is held down continuously whilst the hammer is working, the man holding this in one hand, and the lifting handle L, in the other hand; by means of which the working of the hammer is managed with great expedition and accuracy, and it can be instantly stopped and held fast whenever required, by merely letting go the brake handle.

The frame that carries the bearings of the lifting rollers and break, is mounted upon four india rubber springs RR, fixed upon the main cross frame, for the purpose of relieving the friction bar from the shock of suddenly putting the hammer into full motion, when the lifting rollers lay hold of the bar; the india rubber springs are compressed at the first moment, allowing the lifting rollers to drop a little, whilst the hammer is getting into motion.

The bottom end T of the friction bar, is bedded upon several thicknesses of wood, 12 inches thick in all, fixed in the hammer block, the elasticity of which relieves the lifting bar from the end concussions, when each blow of the hammer is struck.

When this hammer was first constructed, the friction bar, which was rather smaller, 4 inches by $\frac{3}{8}$-inch, was fixed in the hammer with a single 4-inch piece of wood below it, and the india rubber springs were not adopted; and it was found that the cotters SS, broke very frequently, about twice a week. India rubber $\frac{3}{8}$-inch thick was then put in between the cutters and T head of the bar, with a better result; and the india rubber springs were afterwards introduced, with the wood packing below the T head of the bar; this arrangement has been found to work very successfully, and it has been in regular work for the last nine months without accident or repair.

The only wear that is found to take place in the machine, is in the friction bar, near where it is first caught by the lifting rollers, for a length of about 14 inches; the wear being at the rate of nearly $\frac{1}{8}$-inch thickness per week, when in constant work. This repair costs very little time and expense, requiring only smiths' work; but in the case of making another similar hammer, it would be preferred to make the bar 7 inches wide instead of $5\frac{1}{2}$ inches, to diminish the wear.

For the Journal of the Franklin Institute.

On the Framing of Steam Engines. By Thomas D. Stetson, M. E.

In all scientific investigations of the proportions, &c., of the steam engine, a large share of attention has uniformly been bestowed on the cylinder, the valves and passages, the speed of piston, and even the thickness and form, as well as length and motion of all the working parts, but little or nothing has been said of the framing by which the whole is supported. Certain points have been assumed as "fixed," and the precise method of fixing, or even a suggestion with regard to how this may be best accomplished with the least labor and material, has been left to the unaided judgment of the designer in each particular class. In some cases this judgment or taste of the draftsman is very nearly perfect, but in general it is only imitative, and frequently exhibits a most deplorable lack of both intuitive and scholastic science by adopting and perpetuating very nearly the worst possible forms. The facility with which complicated forms may be reproduced and multiplied in cast iron, has led properly enough to the exhibition of considerable architectural taste in the framing of beam engines for stationary purposes. But this display, when it leads to the construction of a series of vertical columns, supporting an entablature above, becomes an abomination at which the sensitive mind revolts as from the leaning tower at Pisa. There are particular cases, it is true, in which circumstances justify the expenditure of much material and labor to construct a cumbrous frame which shall excite admiration by its grace or inspire awe by its extent. The pumping engine at the Brooklyn Navy Yard, is an example of the latter effect, and the sensations produced in the beholder by the immense canopy of castings, glittering with bronze, are no doubt the main end and aim of the construction. The fact that the frame is some inches too large in each direction for the house in which it stands, required that the solid granite should be grooved out to that extent on two sides of the building, but this was evidently a mistake, as also may have been the whole design of the framing. More probably, however, it was a study for effect, an end which was well served by constructing a fancy architrave with pillars, steadying the whole by leading massive girders from its top to the four walls of the building, and supporting their extremities by pilasters. Less wealthy employers, however, prefer in general to make a less ostentatious display, strength and stiffness being the main objects, and overwhelming effect only a matter of fourth rate importance.

English engineering presents numerous examples of the same kind of frame, or of what is little better, a solitary pair of vertical pillars rising from the centre of the bed-plate and steadied by bracing horizontally from their top to the walls of the engine room. And it is but a few years since a large beam engine was erected in a rope-walk in Plymouth, Mass., by one of our best Boston builders, on substantially the same frame as the pumping engine alluded to, but without the spreading canopy of arms. To the eye of the public, and even to some tolerably skilled mechanics, there is a peculiar beauty in this rich entablature and clustering columns, but upon loading the engine and admitting the steam at full pressure, the wrenching strains arising from the inclined positions of the links and connecting rods through which all the force is transmitted, rocked the frame like an inverted pendulum. The remedy was the adding as an afterthought, of several stiff braces from the end of the entablature to the wall, a simple method of transmitting to the stronger structure, an ague which should never have been inherited from its English prototype.

The ancient Hindoos and Indians sculptured their buildings with real and imaginary animals and vegetables by way of ornament; the Egyptians combined the tent of the wanderer with the cavern of the hills, and developed the heavy pyramidal masses which we call Egyptian architecture. The Greek combined both the ornament and massiveness of the above with the light cabin-like structures of their primitive condition, and produced the beautiful Doric, Ionic, and Corinthian, but all the popular and unpopular forms of architecture derive their chief attraction from their fitness. Habit and custom has made even the unornamented arch of the Romans a perfect picture of substantial grace and beauty, but the pleasure it inspires springs, at least originally, from its most obvious and extreme utility. In all these cases the mason and stonecutter were contending against the simple gravity of masses at rest, but the possession of the founder's art and the varying and angular nature of the strains upon a reciprocating steam engine, make the effort for architectural effect in the general contour of an engine frame as puerile and ridiculous as would be an attempt to make a railroad car resemble a donkey, or a steamboat cabin the side-saddle on which our grand parents rode to church.

In the horizontal or vertical direct-acting engine, there is a considerable lateral force arising from the pressure of the gibs of the cross-head upon the slides, but the principal strain upon the frame is a direct thrust and pull, equal to the action of the steam upon the piston. The pressure of the gibs upon the slides depends on the length or rather on the shortness of the connecting rod, and may with a little care be obtained by the geometrical decomposition of forces. Or it may be obtained by multiplying the available pressure on the piston by the tangent of the angle made by the connecting rod at any moment.

The *amount* of the strain may not be of any considerable consequence, since, however great it may be proved, the occasional presence of water in the cylinder requires a large surplus of strength in all the parts. But the *direction* of the forces acting at certain points is a matter of serious moment, as either from total ignorance on this point, or the most culpable neglect in matters of so much importance, most hideously dis-

torted frames have been designed and brought into existence both in manufactories and in the hulls of otherwise splendid steamers.

The direct-acting engines, whether Copeland's inclined condensing, or the many forms of propeller engines, and high-pressure timber-framed machines on our western waters, may be dismissed by simply remarking that *the strain on the shaft at the centre of the crank is always in a line parallel to the axial line of the connecting rod, and equal in amount to the effective pressure on the piston multiplied by the secant of the angle between the connecting and piston rods.* In the square engine there is required little in fact that deserves the name of frame except the vertical slides which guide the cross-head. The beam engine and oscillating, now decidedly the two most popular for all general purposes, are most open to suggestion, and on these classes let us bestow a few moments close attention.

The beam-centre, whatever the manner in which it is supported, sustains a strain equal to about twice the effective pressure upon the piston, and the direction of this force depends on which end of the cylinder is receiving steam, and also on the inclination and relative force transmitted through the front-links and connecting-rod. The links give an alternate thrust and pull, equal to the whole action on the piston, multiplied by the secant of the angle at which they stand. Transfer this strain, or suppose another equal to it acting at the beam-centre in a parallel direction and with the same intensity, we thus obtain one portion of the strain upon the centre. Next decompose the force exerted by the front-links and find what portion tends to give motion to the beam. Draw a line perpendicular to the beam at its other extremity and find by what angle the connecting rod varies from this line. Multiply the force just found by the secant of this angle, and the result is the amount of thrust or pull on the connecting rod. Transfer this force or suppose another similar to be acting at the beam-centre in line parallel to the position of the connecting rod and in a direction the reverse of its motion. This makes the other portion of the force acting on the beam-centre, and by compounding these strains, and obtaining a third equal to both the former, we obtain the actual strain.

Were the front-links and connecting-rod infinitely long, the strain on the beam-centre would be always vertical, forcing it directly up or directly down, and the amount of force would, in all cases, be twice that on one end of the beam alone, or on the piston. This condition is equally true whether the beam be at rest or in motion, since whatever force is exerted at one end is always reproduced at the other, increased or diminished very slightly by inertia. The common grocer's scales furnish an instance of a force acting on an equal beam against a balancing force, and the centre is of course compelled to bear the weight of both.

It is a comparatively easy matter to project on a large side elevation of a given beam engine the true directions and amounts of the strains at every moment of the stroke, modifying it, if necessary, by the varying pressure of the steam consequent on its expansion. This may be a pleasant amusement for the amateur and may be necessary to the designing of a strictly perfect frame, not forgetting of course to provide for working backwards, nor to allow for the effect of the slides, air-pump links,

&c., but this is labor which is unproductive and unnecessary. It is sufficient for our present purpose to show that the strains are not always, nor indeed generally vertical, but vary to an extent nearly equal to the greatest angle of the connecting rod. The mechanic who would mount such a centre on a series of vertical pillars without a single diagonal brace, would sit on the branch of a tree till he had sawed it off, and broken his leg in the fall. But this is not all. The bed-plate or some fixture connected therewith requires a strength and stiffness equal to that of the beam. At one extremity is the cylinder, and at the other the crank pillow block alternately striving to jump up or plunge down together with all the energy of the imprisoned vapor. Above them is the beam pillow-block, which is, as we have seen, always impelled at the same moment in a nearly opposite direction with a force equal to both. What can be simpler than to connect them by a triangular frame, and relieve the bed-plate and all the parts at once from any strain except that of simple extension and compression.

Messrs. Corliss & Nightingale, of Providence, the most extensive and successful builders of large stationary engines in America, construct all their frames in a style very closely approximating this form. The frames are two upright castings with braces of wrought iron extending diagonally in both directions from points near their tops. Theory indicates points nearly abreast of the cylinder, and of the pillow-block, as the proper attachment for these braces to relieve the bed-plate, but as it is of more importance to support the beam properly, the divergence of these diagonals is not far from correct. For either purpose, however, they should range exactly towards the axis of the beam-centre, unless some consideration of convenience overrules.

Otis Tufts, of East Boston, constructs a frame very nearly approximating to the form described, making it all of cast iron and possessing considerable architectural grace.

Mr. T.'s castings all appear to be on a cursory examination, enormously heavy, to which point as much perhaps as to their nearly correct form may be due the fact (referred to with honorable pride by the principal of the establishment) that although some fifteen years a builder of this kind of machinery, his engines have never yet failed in any principal part.

The well known and popular firm of I. P. Morris & Co., Philadelphia, have constructed a style in which the beam pillow block is carried on large hollow castings resembling truncated pyramids. This pattern, an example of which is running, or was a year since, in a large cotton mill in Lancaster, Pa., is capable, by spreading sufficiently, of making a very successful approximation to the triangular truss desired, or if much too narrow may be supported by inclined braces, as was the case with the engine observed.

A very elegant, light, strong and in every respect desirable frame may be constructed of gothic arches dexterously applied together, and with a little effort not only the general form of a triangle may be preserved, but the metal may be so distributed that the strains in the directions already indicated may be carried in almost a right line. The Novelty Iron Works, New York, have recently constructed several in this style, two of which

may be seen at the Empire Iron Works at Twenty-fifth Street, and approach more by accident than by design to the true mathematical form.

In the oscillating engine the strains are extremely simple, and on this account this class might with propriety have been the first instead of last in our investigation. In this class the trunnions and pillow-blocks are always thrust apart or drawn together with an energy exactly equal to the effective pressure on the piston. The direction of the force is always in or parallel to the line of the piston rod. Assuming that the cylinder be directly beneath the crank, the frame of least material is evidently two triangles both resting on the same base; but leaving out of the question the disposition of material below the trunnions, it may be sufficient to observe that the pillow-block should be supported on a stout triangle, the sides of which incline to an extent equal the greatest inclination of the piston rod. The framing of the engines of the steamship "*Knoxville*," designed by Mr. D. G. Wells, approximates to this, the wrought iron standards spreading at the bottom, and ranging upwards towards a point some feet above the centre of the shaft. In this case there is a necessity for this in order to conveniently remove the cylinder cover, but in the Corliss beam engine alluded to above, the braces range toward a point considerably below the beam-centre for no assignable reason, although in every other feature the Corliss Engine shows a masterly struggle for complete perfection of every detail.

It may seem invidious to point out instances where these principles have been overlooked. Attention has never been called particularly to their importance, and in fact the direction and intensity of the strains has probably never before been analyzed in print. The result is, that our shops, manufactories, and steamships, are full of large, and in many respects splendid engines, but with miserable abortions as substitutes for frames. "Mone's Treatise on American Engineering," the latest and best collection of detail drawings ever published in America, spreads before the world a beam engine with the beam mounted on a single pair of pillars, unsupported except by the building in which it stands, and the design being already published may be alluded to with freedom. "Stuart's Naval and Mail Steamers" has given correct drawings of the "*Golden Gate*" and "*Illinois*," in both which vessels the pillow-blocks are carried on stout vertical columns, with slight and almost insignificant diagonal braces. America can do better than this, and is doing it, yet for want of a distinct enunciation of a few principles, obvious enough when once fully presented, we continue in too many cases to imitate and perpetuate error.

New York, May 23d, 1855.

For the Journal of the Franklin Institute.

Description of Improvements in Feeding and Circulating Water in Steam Boilers. Patented by THOS. CHAMPION, of Washington City, D. C.

The annexed engravings represent Thomas Champion's patent mode of feeding and keeping up continuous rapid circulation in steam boilers, through a sprinkler, and his patent furnace and direct action exhaust

steam blower, which saves all the room, expense, and friction of a mechanical blower, and all the heat of the exhaust steam and fuel after the engine is in motion.

The present engravings show these improvements attached to two of the common double flue cylinder boilers, such as are used for stationary engines and for western steamboats, but they are applicable to all kinds and purposes. Letter A, is a pipe to which the feed pump or supply pipe is attached; B is a valve in said pipe hinged above at its junction with pipe C, which intersects above with the boilers at or near their bottom; D are coils, the extension of pipe A round the surface, to protect the plates from the intense heat of the coal, forming sides or a basket for the fuel above the grate, after which the coils or turns may be still further extended into a hollow grate E, in a square furnace such as the present; the convolutions are not round, but are turned suddenly at each corner, until a hollow grate is formed and the tube at F extended through the fire space to the rear end of the boilers, where it is divided into as many branches as may be deemed requisite, to have sprinklers G, extending through the length of the boilers, to which these branches are united, to spray or jet the plates on any or every part of the fire surface should it become bare of water.

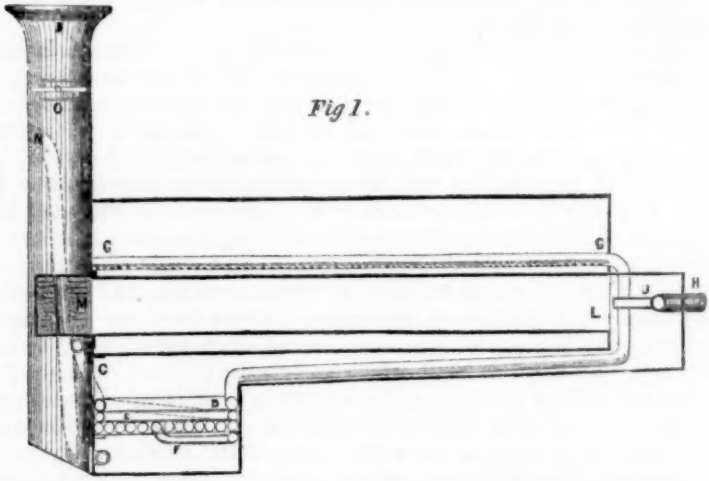


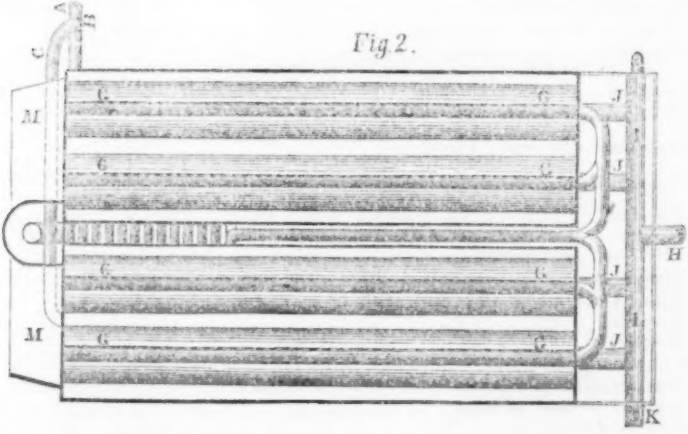
Fig 1.

The sprinkler is pierced with a series of small apertures at the proper angles, to sprinkle part or the whole of the internal surface, where fire is acting on the opposite sides of the metal. While the pump is feeding or the supply passing into the boiler, the valve B will raise with the pressure under it, closing the pipe C, and the feed-water will pass on through the coils, grate, tube, and sprinkler, entering the boiler intensely heated; but should the pump fail to supply, the steam and hydrostatic pressure in the boiler and pipe, C, will then open the valve B, and admit the water from the boiler into the coils, and the intense heat to which these coils are subjected cause the hot water and vapors to pass upward with

continuous rapidity through the sprinkler, jetting and spraying the plates, whether the pump is feeding or not, so long as any water remains in the boilers; thus all the water may be evaporated, the steam exhausted, and the engine stopped, yet no explosion take place, nor even the boiler be injured, provided the fire be extinguished as soon as the engine shows signs of stopping. With one-third the usual quantity of water in the boilers, and the continuous showering of the plates, renders the evaporation three times more effective, and the mode of feeding cold water round through the coils in contact or nearly so with the fire-box plates, admirably prevents their destruction, and saves much heat and loss in replacing burnt grate bars.

For single or double flue cylinder boilers is also placed a drying pipe I, in the rear end of the fire space, into which the exhaust steam from the engine is conveyed by the pipe H; the drying pipe has as many exit pipes J, conveying the exhaust steam into the centre of each flue of the boiler, to force the return of the unconsumed heat, smoke, and gas, from underneath the boilers through the flues and down the passage by the direct action of the exhaust steam from the pipes J, which exhaust commingles with the products of combustion, becoming part and parcel thereof, aiding in the intensity of heat, round and round the continuous current, which receives small supplies of fresh air in jets from the pipe N, between each puff of the exhaust, which gives life to the fire, with a closed chimney, furnace, and ash pit. An additional pipe K, is fitted to

Fig 2.



one end or middle of the drying pipe, with a valve in it for the escape of a small portion of the exhaust steam into the atmosphere, should it exert too much force on the fire when running at the greatest speed. M, M, are conduits leading the products of combustion from the flues up the stack while the damper O is open and the fire is kindling and steam is raising, but when steam is up, the damper and ash pit closed, and the engine running, then the exhaust forces all down the stack beneath the grate, and up through the fire round and round, saving and burning all the heat, smoke, gas, and exhaust steam.

And the size of new boilers to which these improvements are to be

attached, may be reduced, at least one-third, as the whole boiler may be enveloped in the furnace, except a small dome or drum to take dry steam from.

For the Journal of the Franklin Institute.

Particulars of the Steam Propeller Sovereign.

Hull and Machinery built by Messrs. Launi & Co., Glasgow. Intended service, Black Sea.

HULL.—

Length on deck from fore part of stem to after part of stern post, above the spar deck,		196 feet	9½ inches.
Breadth of beam at midship section—*molded*,		24 "	10 "
Depth of hold,		18 "	1 "
Length of engine and boiler space,		45 "	3 "
Draft of water at load line,		11 "	
" " below pressure and revolutions—*average*,		10 "	6 "
Tonnage, Hull, 379 } (Eng.) 602			
" Engine Room, 223 }			
Contents of bunkers in tons of coal,	120		
Masts and rig,	Brig.		
Weight of hull, (iron) 448,000 (wood, &c.) 336,000 lbs.			

ENGINES.—Angular Geared.—

Diameter of cylinders,		40 inches.
Length of Stroke,	3 feet.	
Maximum pressure of steam in pounds,	15	
" revolutions per minute,	38	
Weight of engines in pounds,	156,800	
Nominal horse power,	100	

BOILER.—One—Horizontal Tubular.—

Length of boiler,		17 feet 16 "	6 inches.
Breadth "		10 "	3 inches.
Height " exclusive of steam chimney,		9 "	6 "
" " inclusive "		14 "	6 "
Weight of " in pounds with water,	67,200		
Number of furnaces (3 at each end,)	6.		
Breadth "		2 "	8 "
Height "		2 "	11 "
Length of grate bars,		6 "	6 "
Number of tubes of brass,	456.		
Internal diameter of tubes,			2⅞ "
Length of tubes,		6 feet.	
Diameter of smoke pipe,		3 "	6 "
Height "		24 "	
Description of coal,	Bituminous.		
Consumption per hour,	1650 lbs.		

PROPELLERS.—

Diameter of screw,	11 feet	6 inches.
Pitch of screw,	11 "	6 "
Number of blades,	2.	

Remarks.—Frames *shape and dimension*, L 4 by 3 by $\frac{7}{16}$; *distance apart at centres*, 18 ins. Plates, *thickness*, $\frac{5}{8}$-to $\frac{3}{8}$-ins., and 16 strokes from keel

to gunwale. Launching draft, with all machinery on board, (average) 8 feet 5 ins. Displacement, 450 tons—stem, 6 by 2 ins.—stern post, 6 by 4 ins. H.

For the Journal of the Franklin Institute.

Particulars of the Steam Propeller Candia.

Hull built by J. C. Mase & Co., Machinery by G. Rennie & Co. Intended service, Southampton to Alexandria.

HULL.—

Length on deck from fore part of stem to after part of stern post above spar deck,	281 feet.	
Breadth of beam at midship section above the main wales—*molded*,	40 "	
Depth of hold,	29 "	6¾ inches.
Draft of water below pressure and revolutions (mean)	18 "	7 "
Tonnage,	2200. Eng.	
Displacement of Hull,	2520 tons.	

ENGINES.—Two—Geared Trunk.—

Diameter of cylinder, mean		70¾ inches.
Length of stroke,	4 feet.	
Maximum pressure of steam in pounds,	21.	
" revolutions per minute,	36½.	
" speed,	12.	
Horse power nominal,	450.	
Indicated "	1356.	

BOILERS—

Description of coal,	Bituminous.

Remarks.—This vessel is considered to give the best result, all things considered, of any English steam propeller yet built. H.

For the Journal of the Franklin Institute.

*Particulars of the Steamer Ericsson.**

DEAR SIR.—Having, in compliance with your request, embarked on board the *Steamer Ericsson* on the 28th inst. for the purpose of witnessing the performance of her machinery, and having received authority from you to control the operations of it in such a manner as I saw fit for the purpose of advising myself of the consumption of fuel in her furnaces, speed of vessel, &c., I have now to submit to you the following report of my observations, and for the purpose of ready comparison and estimate of the value of the elements submitted, I give the following particulars of hull and machinery.

HULL.—Length on deck, 250 feet; breadth of beam, 40 feet; depth of hold, 27 feet.

Draft of Water.—Forward, 17 feet 2 inches; aft, 16 feet 10 inches; (mean 17 feet.) Coal and water on board, 550 tons; area of immersed midship section at this draft, 546 square feet.

MACHINERY.—Two inclined engines of direct action.

CYLINDERS.—62 inches in diameter by 7 feet 8 inches stroke of piston.

* Originally communicated to the New York Tribune.

WATER WHEELS.—32 feet in diameter by 10 feet in width.

BOILERS.—Two vertical tubular—supplied by fresh water from the external condensation of the steam. Natural draft to furnaces.

Cut-off.—Drop valve, with adjustable arrangement, set in this experiment at $\frac{45}{100}$ths of stroke of piston.

Dip of Water Wheel Blades.—4 feet 6 inches.

COAL.—Anthracite, Pittston.—Bituminous, Cumberland.

Results of Experiments.

1. *Anthracite.*—At sea, May 28th, 1·45 P. M. to 2·16 A. M. 29th, 12 hours and 30 minutes—consumed 26,400 lbs.=2112 lbs. per hour, or ·94 of a ton (of 2240 lbs.) per hour.

2. *Bituminous.*—At sea, May 29th, 2·15 to 11·30 A. M., 9 hours and 15 minutes—consumed 15,390 lbs.=1664 lbs. per hour, or ·74 of a ton per hour.

3. *Anthracite.*—At sea May 29th, 11·30 A. M. to 1·45 P. M., 2 hours and 15 minutes—consumed 4320 lbs.=1920 lbs. per hour, or ·85 of a ton per hour.

Recapitulation.

1st.	12	hours	30	minutes	× 2112 lbs.	=	26,400	lbs.
2d.	9	"	15	"	× 1664 "	=	15,392	"
3d.	2	"	15	"	× 1920 "	=	4,320	"
	24		00				46,112	lbs.

the total consumption for 24 hours = 20·58 tons.

The average pressure of the steam was $22\frac{5}{8}$ths lbs. per square inch; the vacuum $27\frac{1}{2}$ inches; and the average revolutions of the engines, $13\frac{3}{8}$ths per minute.

The speed of the vessel as measured by a chip log with 25 fathoms of stray line, was 11 knots, large, = 12·83 statute miles per hour.

The fresh water condensers, maintained an uniform vacuum of $27\frac{1}{2}$ inches of a mercurial column, and, by aid of an anxiliary distilling vessel, more water was readily obtained than was required to meet the loss by vents and leaks from the boilers, pipes, &c., &c.

With a view to test the evaporative qualities of the boilers and at the same time to verify the extraordinary results here given in economy of combustion, the water of condensation therefrom, was at six different periods, measured in a vessel, and the supply was found to reach the unexampled quantity of 9·96 lbs. per pound of anthracite coal consumed, and notwithstanding this unprecedented attainment in a marine engine, it could have been very materially increased with better firing of the furnaces.

In conclusion, it may not be amiss for me to add, that all the elements of means and results here given, were noted by myself, so far as it was practicable for me to do so, and such as I had to transfer to the observations of others, were alone confided to my two assistants, who accompanied me on this occasion for such service.

I am, respectfully, yours, &c.,

CHAS. H. HASWELL.

JOHN B. KITCHING, ESQ., New York.

Remarks by Committee on Publication.

The economy of fuel adverted to in the preceding statement may be readily accounted for, and, in our judgment, is *not* extraordinary when the circumstances of the case are considered. It is due to two causes: 1st, To the large amount of grate and heating surface per pound of fuel used. 2d, To the use of a surface condenser, (in which the "*Ericsson*" is not peculiar.) Supposing the data correct,* the results are certainly good; but when 7000 feet of heating surface are employed to evaporate 311 cubic feet, or 19,400 pounds of water per hour, we believe that other steamers will compare with the "*Ericsson*," on at least equal terms in point of economy. The really extraordinary feature of the trial is, that so little water was evaporated with so much boiler surface.

M.

Steam as an Industrial Agent.†

Mr. William Fairbairn, whose great services in developing mechanical science can never be overlooked or forgotten in any quarter of the world where mechanical talent possesses rank at all, has just given one more proof of his attention to the exigencies of the times, by delivering two elaborate lectures at the Manchester Mechanics' Institution, on "Steam, its Properties and Application to the Useful and Industrial Arts." In that great centre of steam power, such a subject, commented upon by such an authority, and coming, too, in the wake of the movement there making to secure a better system of steam superintendence, was certain of meeting with more than ordinary attention; and we are glad to find that the lecturer's efforts were duly appreciated by the large audiences assembled to meet him. In that portion of his discourse which related to boilers, he stated that the cylindrical or spherical was the most eligible and the strongest form in which iron plates would resist internal pressure. The deduction for loss of strength, on account of riveted joints and the position of the plates, was about 30 per cent. for the double riveted joints, and 44 per cent. for the single ones; the strengths (calling the plates 100) being in the ratio of 100, 70, and 56. He found that 34,000 lbs. to the square inch was the ultimate strength of boilers having their joints crossed and soundly riveted. Flat surfaces, frequently essential, were not so objectionable with respect to strength as they appeared to be at first sight, but when properly stayed, were the strongest part of the construction. This was proved by the result of experiments made on the occasion of the bursting of a boiler at Longsight. Two thin boxes, 22 inches square and 3 inches deep, were constructed. One corresponded in every respect to the sides of the fire-box of the exploded boiler, the stays being in squares,

*Exception must be taken in this connexion, to the manner of ascertaining the amount of water evaporated. Why were not indicator cards taken and the results calculated, as is the *universal* custom in such experiments? Short trials of the amounts of water drawn from the condenser in a given time, form an entirely novel method of getting at this datum; and where the quantities delivered vary at different times cannot be so conclusive as the ordinary method, which excludes all possibility of error.

† From the Lond. Pract. Mechanics' Journ., April, 1855.

5 inches asunder, and the side containing 16 squares of 25 inches area. The other contained 25 squares of 16 inches area, the stays being 4 inches asunder. One side of both boxes was a copper plate ½-inch thick; and the other side of both an iron plate three-eighths inch thick. To these the same valve, lever, and weight were attached, and the pumps of an hydraulic press applied. That divided into squares of 25 inches area, swelled ·03-inch with the eighth experiment, at a pressure of 455 lbs. to the square inch. At the nineteenth experiment, with a pressure of 785 lbs. to the square inch, the sides swelled ·08-inch; and at a pressure of 815 lbs. the box burst by the drawing of the head of one of the stays through the copper, which, from its ductility, offered less resistance to pressure in that part where the stay was inserted. The tenth experiment, with the other box of 16 inch areas, resulted in a swelling of ·04-inch, the pressure being 515 lbs. to the square inch. At 965 lbs. the swelling was ·08-inch, and from that point up to 1265 lbs. the bulging was inappreciable. With the forty-seventh experiment, at a pressure of 1625 lbs., one of the stays was drawn through the iron plate, after sustaining the pressure upwards of 1½ minutes, the swelling at 1595 lbs. having been ·34-inch. The first series of experiments proved the superior strength of the flat surfaces of a locomotive fire-box, as compared with the top or even the cylindrical part of the boiler. The latter evidenced an enormous resisting power, much greater than could be attained in any other part of the boiler, however good the construction; and they showed that the weakest part of the box was not in the copper but in the iron plates, which gave way by stripping or tearing asunder the threads or screws in part of the iron plate. According to the mathematical theory, the strength of the second plate would have been 1273 lbs.; but it sustained 1625 lbs., showing an excess of one-fourth above that indicated by the law, and that strength decreased in a higher ratio than the increase of space between the stays. The experiments show a close analogy as respects the strengths of the stays when screwed into the plates, whether of copper or iron; and riveting added nearly 14 per cent. to the strength which the simple screw afforded. These experiments were conducted at a temperature not exceeding 50° Fahrenheit. His experiments on the effects of temperature on cast iron, did not indicate much loss of strength up to a temperature of 600°; and he concluded that the resisting stays and plates of locomotive boilers were not seriously affected by the increased temperature to which they were subjected in a regular course of working. At the termination of the second lecture, Messrs. E. T. Bellhouse, Fenton, and Kay, severally explained a set of models and drawings of safety valves. Mr. Bellhouse directed the attention of the audience to Cowburn's "oscillating safety valve," as illustrated by us last month; he also explained some diagrams of vacuum and float valves, the joint invention of himself and Mr. Cowburn. Mr. Fenton's valve was shown to be composed of two globular valves under the same lever; at one end of the lever is an adjustable spiral spring, which when set, can be covered up and locked, so as not to be interfered with; the other end of the lever has an ordinary spring balance. The peculiarity of this valve is, that if a greater weight be put on the exposed end of the lever, the one ball valve becomes the fulcrum, and causes the other valve to be raised, and allows of the exit of steam at a

lower pressure than the spiral spring is set to. Mr. Kay's valve is on the piston principle, so arranged as to afford a large area for the emission of steam.

---

*Important Improvement on the Electric Telegraph.**

A discovery is said to have been recently made at Stockholm, which, if it can be realized and practically applied, will tend greatly to facilitate telegraphic communications. The discovery to which we allude is the means of transmitting two messages at the same time along a single wire.

It is evident that if at the same instant a message is sent along a wire in one direction, another message could be speeding its way through the same wire in the opposite course, one-half the number of wires would be sufficient, and there would consequently be a great saving in the cost of forming new telegraph lines, and that those already laid down would be enabled to transact double the amount of business they are now capable of doing. To those who are not acquainted with the modes of transmitting electric telegraph signals, it may appear at first sight impossible to send messages in opposite directions at the same time along a single wire, as one current of electricity, it might be supposed, must necessarily clash with and counteract the transmission of another current in the opposite direction. But, in point of fact, not two only, but hundreds of electric currents in different directions are frequently passing through the same medium, without the slightest interference. The difficulty to be overcome is altogether of a practical kind, and that it does not arise from any limited capacity in the wire may be shown by the actual practice in existing telegraphs.

In the early days of the electric telegraph, before the conducting power of the earth was well known, a single wire only was employed for the return current, though several were required to transmit messages, and through that single wire different currents were often passing at the same instant. When the conducting power of the earth was applied to complete one-half the circuit, the moist ground became the transmitter of currents from every electric telegraph that was established, and through that medium there are now passing messages of all kinds, which, though mingled together in mother earth, become separated at the poles of their respective voltaic batteries, and are delivered without any interference with one another. Thus in constructing a telegraphic line, a wire insulated from connexion with the ground, by being supported on posts, is extended between the towns to be placed in communication, and at each end the wire is connected with a copper plate buried in the earth, to complete the voltaic circuit. These plates of copper, technically called "earth plates," or more commonly "earths," conduct the electricity from one to the other through the moisture of the earth much more readily than any artificial metallic conductors that could be laid down; the resistance thus offered to the transmission of electricity being so small as to be scarcely appreciable. These earth connexions are so convenient

*From the Lond. Civ. Eng. and Archt. Journ., May, 1855.

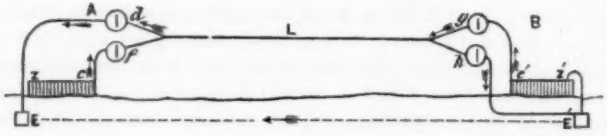
that they have been formed at all the stations where telegraphs have been established, which are thus voltaically connected together. Suppose, for instance, that the zinc end of a voltaic battery is connected with the earth, and that the copper end is connected with a needle instrument in London, and that that is connected with the telegraph wire supported on posts and extended to Edinburgh, where, after passing through a corresponding instrument, it is connected with a metal plate buried in the ground. The electric current will then pass through the instrument in London, along the wire to Edinburgh, where it will deflect the needle, and passing on to "earth," will there come into instantaneous connexion with the zinc end of the battery from which the current emanated, and will return to that battery regardless of all interposing electric currents that may be passing through the earth at the same time. A slight knowledge of the nature of a voltaic battery will be sufficient to prove that it could not be otherwise. No excitement of voltaic electricity can take place unless there be a connexion between the two poles of the battery. So long, therefore, as the wire at Edinburgh continues detached from the earth plate, the battery in London remains inactive, provided the wire be perfectly insulated. It is by the act of bringing the two poles into connexion by means of the wire and earth plate at Edinburgh that the electricity is excited, and the current is sent in that direction alone. The action of all other batteries that may be connected with the earth, cannot affect the electric current thus established between London and Edinburgh, because they do not contribute in any way to complete the circuit by which alone the electricity is at once excited and transmitted. A metallic conductor, in the same manner, will connect the opposite poles of any number of batteries, and will thus serve to transmit several different electric currents without their interfering. It would not be difficult, indeed, to make a single wire form part of the circuits of one hundred different batteries, each one of which might be transmitting distinct telegraphic messages.

From this consideration of the facility with which a single wire can conduct different electric currents, it might be supposed that there would be no difficulty in completing such an arrangement as is now said to have been effected in Sweden, and that one wire might be made to serve the purpose of the thirteen that are supported on posts near London, in addition to others that are buried underground. It is nevertheless one of those things which, though often attempted, has not yet been practically accomplished; nor do the accounts of the discovery by Prof. Edlund, of Stockholm, represent him to have done more than send two currents along the same wire, and those in opposite directions. The great difficulty to be overcome in endeavoring to effect such an arrangement is, to prevent the electric current from the transmitting battery, from making a short circuit through the adjoining instrument, instead of traversing the wire to the corresponding instrument at the distant station. The accompanying diagram will serve to show the direction which the electric current would take, if there were no special provision to break contact with the near instrument.

Let *d*, *f*, fig 1, represent two telegraph instruments at the station A, the upper one of which, *d*, is intended to receive messages transmitted from the

instrument *g*, at the station B; and the lower one, *f*, is the instrument connected with the voltaic battery *c z*, from which messages are to be transmitted to *h*, along the line wire L, to the earth plate E', and through the earth, back to the battery. It will be perceived, however, that as

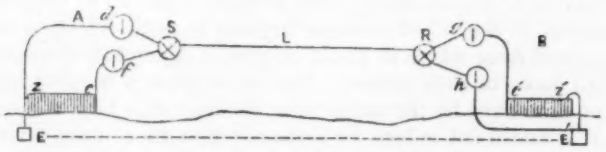
Fig. 1.



the instrument *d*, is also connected with the line-wire, and with the earth plate E, that a short passage is open for the transmission of electricity from *c* to *z*, in the direction of the arrows, without traversing the line-wire, consequently there would be no electric current sent to the instrument *h*. The same effect would attend the arrangement at B, where a short circuit would be also established through the second instrument, and no communication could be made between the distant stations. If, again, it were attempted to send several messages along a single wire in the same direction, by having separate batteries and instruments, the electric currents might be transmitted to the distant instruments, but they would pass through all of them indiscriminately, producing an incomprehensible medley of signals. The problem then to be solved is, to make an arrangement by means of which the electric current from the battery at A, may be sent along the line-wire, without being diverted through the instrument *d*, and yet at the same time to maintain such a connexion between the instrument *d*, and the line-wire, and the earth, that it may be always in a state to indicate the signals that may be transmitted to it from the corresponding station.

No description has yet been received of the mode by which Prof. Edlund proposes to overcome the difficulty, but we can fully understand the principle on which such an arrangement may be made, and we may venture to point out the means by which it might be successfully accom-

Fig. 2.



plished. Supposing the arrangement of the instruments and batteries to be the same as in the preceding diagram, let there be introduced at the points of junction with the line-wire, small instruments for making and breaking contact, R and S, fig. 2.

The cross-lines in the contact-wheels represent strips of metal inlaid in

wood, and when in the position shown in the diagram, the instrument *h* would be connected with one end of the line-wire, and the instrument *f* would be connected with the other end, whilst the two instruments *d* and *g*, would be out of contact. Under these circumstances an electric current would pass from the battery at the station A, through *f*, to the instrument *h*, whence it would be transmitted to the earth, and by thus completing the circuit those two instruments might communicate with each other as perfectly as if there were no other instruments connected with the wire. If the wheels, R and S, make the eighth part of a revolution, the positions of the wires forming connexion with the instruments would be reversed, and then *f* and *h*, would be thrown out of contact, and the current would be transmitted from the voltaic battery at B, through *g* and *d*, and those two instruments would be able to communicate. It is evident, if the two contact-wheels could be made to rotate exactly together, that independent signals might be transmitted through at least two instruments at the same station at the same time, through a single wire. The synchronous movement of two instruments at distant stations has been accomplished in Mr. Bakewell's copying telegraph; therefore, it is quite possible to effect such an arrangement as the one we have indicated.

But it may be said that this would not solve the problem, because not more than one electric current would be transmitted along the wire at the same instant. The currents would indeed be transmitted alternately, but for practical purposes the effect would be the same as if they were passing at the same instant, for the alternations might be made so quickly as to appear to be continuous, and to answer the same purpose as if they were. Suppose, for example, the wheels, R and S, to be rotating ten times in a second, then as contact would be made and broken four times each revolution, the corresponding instruments might be placed in connexion with each other forty times in a second. The greatest number of beats by the needle telegraph during the rapid transmission of a message does not exceed five per second; therefore, with a much smaller number of alternations than we have supposed, each instrument might be simultaneously sending and receiving messages along the same wire; nor need the number be limited to two instruments and two different stations. It might be possible to arrange on the same principle many instruments connected with others at several stations, and thus all the telegraph communications of an extended line might be maintained with one or two wires, and each station might have a separate means of communication independent of the other stations beyond it, with which it would not interfere, and from which it would be just as distinct as if separate wires were laid down to each station. For the purpose of sending messages in opposite directions by the same wire between only two communicating stations, it would not indeed be necessary that the contact-wheels should rotate synchronously. If one of them was rotating rather faster than the other, the number of times that connexion would be made and broken with the corresponding instruments during a second would be so great, compared with the number of signals transmitted, that the electric current would not be perceptibly interrupted during the transmission of a message. It would indeed be far better that a synchronous movement of the wheels should be arranged, which we believe might be effected at any

number of stations along an extended line of communication by means of an additional wire, for then not only could messages be sent and received at two stations at the same time by one transmitting wire, but several instruments at all the stations might be receiving and transmitting messages with that same wire. By this means two wires might serve the purpose of many, and as those only would be required they might be made thicker and be more carefully insulated than is economically practicable when many are wanted for doing the same amount of business; and thus telegraphic communications might be rendered more free from the interruptions caused by imperfect insulation and by accidents to the wires, as well as much cheaper.

Whether the arrangement we have suggested be similar to that which is said to have been successfully made by Prof. Edlund we have no present means of knowing. We wish to show that such a plan is practicable, and that it might even be extended far beyond the limits to which the accounts yet published state that it has been carried.

---

*Correction of the Compass in Iron Ships.**

I have read with great interest the reports of the discussion on the correction of the compass in iron ships at the late meeting of the British Association,—and I regret much that it was out of my power to be present and to take part in the discussion. Perhaps I may be allowed to remedy this omission by the insertion of some remarks in the columns of the *Athenæum*. I am the more anxious to do this, because the circumstance that a distinguished philosopher, of indisputable competency and impartial character, has now fairly considered the question, places it in a position totally different from any which it has occupied before. I have deep satisfaction in remarking, that the great principles upon which I founded the method of correcting the compass, are entirely recognised by Dr. Scoresby, and even that some minor modifications of those principles (which, as will appear in the remarks below, I had anticipated as probable,) have now been established by Dr. Scoresby's beautiful experiments. In the estimation of the actual extent and rapidity of the changes produced by these modifications, I may perhaps differ in some measure from Dr. Scoresby; and I may be disposed to recommend a practical course, slightly different from that which he would propose. Still, I am happy to find that upon the fundamental points of the theory, we are in complete accordance.

I. It may perhaps be advantageous to give a few steps of the history of this subject. The law, that the greater part of the disturbance of the compass, produced by an iron ship, depends upon its *polar* and not upon its *induced* magnetism (in the ordinary sense of the word, *induced*), was established by me in a paper printed in the "*Philosophical Transactions*" for 1839. The experiments themselves had been made in 1838. In page 212 I observe—"The most remarkable result, in a scientific view, from the experiments detailed above, is the great intensity of the permanent magnetism of the malleable iron of which the ship is composed. It appears, however, that almost every plate of rolled iron, is intensely mag-

* From the Lond. Athenæum, Oct. 28, 1854.

netic." (It is to be noted that I used the term *permanent* magnetism as equivalent to *polar* magnetism.) I then allude to experiments on the magnetism of plates of wrought iron; and these experiments were the last with which I had any acquaintance until I saw some of Dr. Scoresby's beautiful illustrations of the change of magnetism of iron plates. In page 213 I remark, "It seems sufficiently probable that the independent [polar] magnetism of the ship will change with time. This consideration enforces strongly the necessity of periodical examination as suggested above." This is all that was printed by me in refereuce to the change of the polar magnetism of ships and their occasional examination; but it is not the only instance in which I endeavored to bring them before the notice of the proper authorities. In 1839, July 20, I submitted a memorial to the Board of Admiralty on the advantage of a supervision, by the government, of the correction of the compass in iron ships; in which occur the following remarks:—"There is no reason for presuming that the magnetic state of the ship (especially in the case of steam ships) will remain invariable for many years; and there is reason for supposing that it will vary."—"Experiments of various kinds and in various localities should be made on the same ship, for ascertaining whether there is sensible change in different parts of the earth." And with regard to the magnets:—"The important results, lately arrived at by Mr. Scoresby, and wholly unknown to the persons commercially engaged in the fabrication of magnets, show that attention to those points on which the permanency of the magnetism depends, cannot be expected from common tradesmen." The Admiralty (I believe in accordance with precedent and with the rules of the department) declined to undertake the supervision for commercial ships; and, as no other iron ships then existed, this decision amounted practically to a refusal to enter on the matter. Had the subject been then taken up by the Government, it might perhaps have been advanced several years. I did myself endeavor to collect information, and I took notes of the position in which one ship was built; but the occupations of a laborious office compelled me to desist. I may mention, that in almost every instance reported to me, in which the correction failed after a time, I had reason to think that the failure arose from change, not in the ship, but in the correcting magnets; and this consideration, combined with the feeling of want of leisure, prevented the extension of my inquiries.

II. I am deeply struck with the beauty and the importance of Dr. Scoresby's experiments; and if I bring to notice the circumstance that the polar magnetism of iron plates and the possibility of change in the magnetism, were first strongly insisted on by myself, I trust it will not be understood that I mean to say that those experiments are unessential to our present knowledge of the subject. Still, as the first who examined into and speculated upon this subject, I claim the right of criticising the name which Dr. Scoresby has proposed; and I express my opinion that "retentive" ("retained" would be better in grammatical sense) does not exactly represent the characteristics of the magnetism of wrought iron plates. The latter appears to me to differ very little from the magnetism of hard steel bars. A steel bar is magnetised by induction (as in an iron plate)—a steel bar may have its magnetism weakened or reversed:

if immersed in the sea-water, it would probably lose its magnetism sooner than an iron ship would. But as in practice, the magnetism of an iron ship is *slightly* more liable to change than that of a steel magnet *very carefully* preserved, it may be desirable that a name expressive of that idea should be given to it. I would propose to call it, the "sub-permanent polar magnetism of wrought iron."

III. I think it likely that the striking character of Dr. Scoresby's experiments produces an impression of the extent of their applicability to iron ships far greater than is warranted by careful consideration. We may speak poetically of the shocks which a ship receives from the waves; but in reality, the plates of iron of which a ship is composed, sustain no such shocks. The direct effect of the most violent sea upon them is this: that in the course of two or three seconds of time, the plate is plunged five or six feet deeper in the water, and sustains the corresponding hydrostatic pressure. This is very different, indeed, from the raps or slaps in Dr. Scoresby's experiments, in which it is essential that the blow be of the nature of impact, occupying a very small fraction of a second of time. Probably the strain of extension to which the plates are subjected may produce a greater effect: on this, however, experiments are wanting. But even here, the change in the state of extension is not sudden, but gradual. The tremor produced by steam power is more likely to affect the plates in some parts of the ship. It is evident that there are causes in action tending to produce effects like those exhibited in Dr. Scoresby's experiments,—and it is equally evident that the action of those causes must be exceedingly slow. On one point, however, I trust that a consideration of Dr. Scoresby's experiments will disabuse many persons who have not been well acquainted with the nature of induction and sub-permanent magnetism. The change to be expected in a ship's sub-permanent magnetism in sailing from England to the Cape of Good Hope does *not* essentially depend on her passing into another magnetic hemisphere. It *does* depend mainly on this circumstance: that, supposing her to have been built with her head to the north, or in the line of boreal magnetism, she is then turned with her head to the south, or in the line of austral magnetism, and is so kept, exposed to slight tremors, for one or more months. If she had been moored off the coast of Portugal for the same time, in the same position, and exposed to the same tremors, I apprehend that her magnetism would have undergone nearly the same change (as regards horizontal deviation of the compass) as in the voyage to the Cape of Good Hope.

IV. I think the selection of the loss of the *Tayleur*, as the text for the principal discussion on iron ships, with all its attendant horrors (having no application whatever to the matter under discussion), was unfortunate. When the feelings are excited, the judgment of the speaker, as well as of the hearers, is very liable to be perverted. The question at issue is the very abstract one:—Is it likely that in two days the magnetism of a ship could be so much changed that the compass would be disturbed through an angle of two points? I unhesitatingly answer:—It is not likely; and, speaking with our present knowledge on the subject, it is not possible. I have already stated, that I conceive the causes pointed out by Dr. Scoresby, to be wholly inadequate to produce such a rapid change.

And I aver that there is no known instance of such a change; and I do not believe that an instance can be produced of a rapid change of one-fourth or one-tenth part of this amount. I believe that information on these matters is not wanting:—a single firm in Liverpool have "corrected" the compasses in several hundred iron ships, and they cannot fail to have received notification of any such changes as those mentioned above.

Before dismissing this subject, I will advert to two sources of error, not essential to my method of correcting the compass, but to which it may be liable if due care is not exercised. The first is, that captains are hardly aware that a very trifling disturbance in the position of the compass (for instance, a change of a quarter of an inch in the height), may very greatly disturb the neutralizing influence of the magnets. The second is, that the artists who correct the compasses, are too much inclined to place the correcting magnets in the position called "end-on." In this position, the magnet exerts greater deflective power, but it also introduces a force perpendicular to the ship's deck; and this force, when the ship heels, produces an uncorrected horizontal disturbance. While the building in iron was principally confined to paddle steam ships, this was not important; but now, when so many screw steam ships and sailing ships are built of iron, this arrangement ought never to be used. I know not whether the compasses of the *Tayleur* could have been affected by either of these causes.

V. The question, however, which immediately presses is, What (under all circumstances) is it best to do now? In answer, I assert in the first place, and I am supported in this by Dr. Scoresby's experiments, that the source of local disturbance and its laws are perfectly well known; that the disturbance can be neutralized by well known means to the greatest exactness; and that this neutralization is perfect during change of time and change of place, until the ship herself undergoes an organic change. In the next place, I protest strongly against the system, now in use (I believe) in the Royal Navy, of using a table of errors, and thus constantly making numerical corrections instead of once making a mechanical correction. (1.) It is baffling to the mariner. (2.) It is liable to exactly the same errors, in the event of a change in the ship's sub-permanent magnetism, as the system of relying on the mechanical correction. (3.) It is liable to errors peculiar to itself, which would be entirely avoided by the use of mechanical correction. In illustration of the last remark, I will refer to the table in page 104 of the late Capt. Johnson's book on the "Deviations of the Compass," second edition, a work, in many respects, highly valuable. Captain Johnson has given the observed deviations of the compass on board three iron steam vessels in different parts of the world, and I select the last, (the *Trident*) because its deviations were the largest. The deviations in the Thames ranged from 22° 15′ E. to 21° 12′ W. The deviations of the same compass at Malta ranged from 15° 29′ E. to 14° 21′ W. Now the proportion of the terrestrial horizontal magnetic forces in the Thames and at Malta is, as 52 to 75 very nearly. Therefore, if the ship's sub-permanent magnetism remained unaltered, the tangents of the angles of deviation in the Thames and at Malta would have been in the proportion of 75 to 52.

On computing the Malta deviations from those in the Thames by this proportion, we obtain 15° 50′ and 15° 3′; agreeing with those observed more nearly than observations can be made with a ship's compass. The whole of the deviations, recorded by Capt. Johnson for the *Bloodhound*, the *Jackal*, and the *Trident*, at Lisbon, Constantinople, the Piræus, and Malta, can be computed in the same way from those in England, and the results are equally accordant. (The terrestrial horizontal forces on the same scale of proportion are, Lisbon 60, Constantinople 77, Piræus 76.) It follows from this, that the ship's sub-permanent magnetism in each case was unaltered, and its effect would have been exactly compensated at every locality by a permanent magnet. And thus the captain of the *Trident*, using Captain Johnson's table, would have had errors of nearly seven degrees; whereas, if he had used my correcting magnets, he would have had no perceptible error in the whole voyage. I pointed out this result to Captain Johnson: I know not with what effect. (4.) In extreme cases it cannot be used at all: thus, in the Greenland seas the compasses would sometimes turn round with the ship: whereas, there are in the Greenland seas several iron ships with my correcting magnets, effecting their purpose (I am informed) successfully. (5.) In cases not so extreme, the inconvenience is intolerable; thus, in one instance which came under my own eyes, the compass changed 100 degrees with a very small motion of the ship; and the directive intensity in one position was only one-tenth of what it was in another position; these inconveniences are entirely remedied by my correcting magnets.

On considering the whole matter, I am led to give the following as my opinion:—For voyages of moderate duration, as, for instance, not further than to the Mediterranean or to the northern parts of North America, I do not think that any improvement can be made in the existing system except in details, to which I have alluded. The "end-on" position of the magnets ought to be forbidden; and some attention ought to be given to the ship's sub-permanent magnetism in the direction perpendicular to the deck. For voyages of greater duration, as to the Plata, the Cape of Good Hope, &c., I think it desirable that means should be provided for enabling the captain to make the small changes which may be required in the correcting magnets. I am confident, that I can point out a practical course by which this can be effected; and I am satisfied that, with the sanction of one liberal ship-owner, the aid of one intelligent captain, and the command of one ship for a few days, I can arrange every thing with good hope of complete success.

It might, I think, be advantageous that some general supervision should be exercised by the Board of Trade over the correction of the compasses in iron ships; and at no preceding time could reliance be more implicitly placed on the friendly intentions and judicious aid of that Board than at present. It might also be advantageous that the Marine Board of Liverpool should, as a body, interest themselves in the matter. Whatever course may seem best, I shall be happy to give any assistance in my power.

VI. The remarks above are intended by me to apply only to iron built ships, in which the sensible part of the disturbance of the compass is produced almost entirely by the ships' sub-permanent magnetism. In

wood-built ships, in which the induced magnetism is the principal disturbing power, the rules of correction are necessarily different. On these, at present, I have only to make the same general remark which I have made above; that I disapprove of the use of a table of errors, and that I prefer the use of mechanical corrections; the nature of which, as applicable to the neutralization of induced magnetism, is perfectly understood.

G. B. Airy.

Royal Observatory, Greenwich, October 17.

(To be Continued.)

---

*On an Improved Wrought Iron Piston.** By Mr. James E. M'Connell.

This piston is constructed entirely of wrought iron, and it is forged in one piece with the piston-rod, by means of which the ordinary joint between the piston and piston-rod is avoided, and a great saving of weight is effected.

The construction is shown by the drawings, which represent an 18-inch piston for a locomotive engine.

Fig. 1 is a transverse section of the piston;

Fig. 2, a side view of the cover, detached from the piston;

Fig. 3, a sectional plan, showing the interior.

The body of the piston, A A, is a circular disk of wrought iron, which is forged under the steam-hammer, with a portion of the piston-rod, B, formed upon it, about 9 inches long, to which the piston-rod is afterwards welded. The circular ring, C C, is also raised upon the disk in the forging, thus completing the body of the piston in one solid piece of wrought iron.

Fig. 1.—Section.

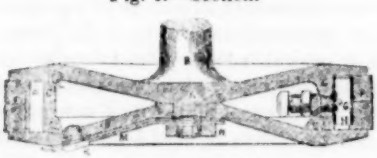


Fig 2.—Elevation of Cover.

Fig. 4.

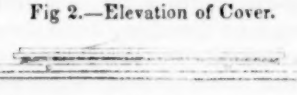
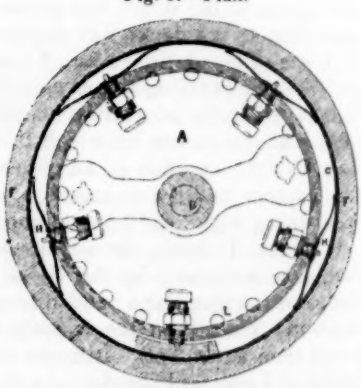


Fig. 3.—Plan.



The wrought iron cover, D D, is screwed into the ring, C C, by a single thread cut upon the projecting rim, E E, on the inner side of the cover, as shown in the detached view of the cover, Fig. 2.

*From the London Artizan, March, 1855.

The cover is dished in the centre as well as the body of the piston, so that the two sides meet in the centre, to diminish the weight of material.

The packing consists of two plain brass rings, F F, lined with a thin steel hoop, G, which fit into a shallow recess on the inside of the brass rings. The four steel springs, H H, are set out against the packing by set screws fixed in the ring of the piston, C C. The fifth set screw is attached to a solid block, I, which is placed at the bottom of the piston, and serves to support the weight of the piston, to prevent it from fluting the cylinder.

Two holes, K K, are provided in the cover for the purpose of unscrewing it, by means of a bar passed through either hole, K, and bearing at the point in a series of holes, L L, sunk in the opposite side of the piston. The holes, K K, are closed by brass screwed plugs, which are kept from turning by a thin brass plate, M, fixed by split pins, as shown in the detached plan, Fig. 4. This plate also secures the brass locking-nut. N, for preventing the cylinder cover from unscrewing: the thread of this nut is right-handed, whilst the main thread of the cover is left-handed.

The weight of this piston, including the piston-rod, is 217 lbs. for the size shown, 18 inches diameter, which is 89 lbs. lighter than the ordinary construction of pistons of the same size, weighing 306 lbs. The weight of a 16-inch wrought iron piston and rod is 160 lbs., being 47 lbs. lighter than the ordinary construction.

This saving of weight amounts to 178 lbs. in the pair of 18-inch pistons, and 94 lbs. in the 16-inch pistons, which is a point of considerable importance at the high speed of 600 to 800 feet per minute, at which locomotive engine pistons are driven; the consequent reduction of momentum adding to the durability of the working parts by reducing the strain upon them, as well as diminishing the disturbing effect upon the motion of the engine.

The solid construction of this piston avoids all risk of accident from the piston working loose upon the rod, which in the ordinary construction is liable to cause the fracture of the cylinder-covers, and sometimes more extensive injury.

There are upwards of 200 of these pistons now in use, and some of them have been at work for two years. The lightness of the piston, and the accuracy of adjustment maintained throughout, in consequence of the absence of joints and loose parts in the construction, allow the brass packing-rings to be worn down to a greater extent than usual before requiring renewal. These rings, of which specimens are exhibited to the meeting, have been worn down to $\frac{1}{8}$th inch from the original thickness, $\frac{3}{4}$ths inch, and lasted twelve months in constant work.

Mr. M'Connell exhibited one of the pistons, 18 inches diameter, and showed the process of taking off the cover, and screwing it on again; also specimens of brass packing-rings that had been worn down.

The Chairman remarked that there was great ingenuity and compactness in the construction of the piston, and the saving in the moving weight was very considerable, and was a point of importance, as well as the avoidance of a joint between the piston and piston-rod.

Mr. M'Connell said the object had been to obtain a piston constructed entirely of the toughest and strongest material, wrought iron, as light as

possible, and in as few parts as possible: the piston and rod, indeed, consisted of only two separate parts besides the packing rings and springs; the cylinder was also shortened and made lighter by the piston being thinner. The greater accuracy of adjustment allowed the packing rings to be worn down thinner than usual; those shown had been worn down to $\frac{1}{8}$th inch from $\frac{3}{4}$ths inch thickness, in about nine months' work.

Mr. CHELLINGWORTH observed that one of the rings had been worn somewhat unequally, being nearly $\frac{1}{8}$th inch difference in thickness at the two ends.

Mr. M'CONNELL said the variation had probably been caused by a little difference in the pressure of two adjoining springs, arising from their not being adjusted quite equally: the rings had generally been found to wear down uniformly.

The CHAIRMAN inquired whether any difference had been found in the amount of wearing the cylinders oval?

Mr. M'CONNELL said the difference had not been noted, but there would be a less effect in disturbing the form of the cylinder, from the piston being one-third lighter than ordinary pistons, as the wear was caused only by the weight lying on one side.

The CHAIRMAN asked whether any disadvantage had been found from rusting of the iron in the interior, the piston being all made of wrought iron; and whether it had been tried in any stationary engines?

Mr. M'CONNELL replied that the joint of the cover, where it was screwed in, fitted so well that water could not get in; and the water being prevented from entering the piston, preserved the interior from rusting. The piston had only been tried at present in locomotive engines, and the construction was most applicable to small quick-moving pistons.

The CHAIRMAN proposed a vote of thanks to Mr. M'CONNELL, which was passed.—*Proceed. of Mechan. Engineers.*

For the Journal of the Franklin Institute.

Some Experiments upon Coffee as a Beverage. By AUGUSTUS T. DALSON and CHARLES M. WETHERILL, Ph. D., M. D.

There are two great classes of beverages in use among all nations of men, whether the most civilized or the most savage. One of these classes is alcoholic, the other may be called, for brevity, the nitrogenized. Physiologists are pretty generally agreed, that the nitrogenized articles of food are especially effective by their union with oxygen in the body in keeping up the supply of animal heat important to life, and that if such food be liquid so as to be more quickly absorbed, it will effect its result more speedily. The South American Indians ferment their maize, reducing it to pulp by mastication; the Pacific Islanders prepare their *arva* from a root in a similar manner; the Tartars, Arabs and Turks ferment and distil the milk of mares and cows, and among the more civilized nations, those of warm climates employ mild wines, while those of cold countries prepare a stronger alcoholic drink by distillation. In general, the colder the climate the stronger is the drink and more deplorable is

the consequence of its abuse. Whether this craving for alcohol in some form or other be an instinct implanted in our nature or not, and if so, whether it be not wiser to direct rather than to attempt to eradicate it, are questions which are at present about being investigated experimentally on a large scale in our country, and whatever be the result, are deeply interesting, not only from a moral but from a psychological point of view. The other class of beverages, containing nitrogen, is one, the use of which is as widely spread as the former. Nitrogenized food is supposed effective to replace the substance of the different organs of the body, gradually wasted away by the processes of vitality.

That which is the subject of this article, *coffee*, although at its introduction, violently opposed and subjected to prohibitory laws, is at present regarded as a boon to humanity, and is cultivated to the extent of six hundred millions of pounds weight*

Besides the tannin in the coffee, and which is somewhat altered during the process of roasting, the berry is characterized by two substances; one, nitrogenized, *caffeine*, which is contained in the proportion of about one per cent. (the same exists in nearly a double proportion in tea,) and is not altered by the roasting process, and the other a peculiar volatile oil developed during the roasting, existing in an extremely minute quantity,† and to which coffee owes its delicious flavor. Dr. Julius Lehman (*Liebig's Annalen* LXXXVII, 205) has investigated the effects of these two substances upon the system, and has shown that coffee retards the waste of the tissues of the body, and that consequently its use diminishes the amount of food necessary to preserve life. This effect he ascribes to the latter. These two acting to excite to greater activity the nervous and vascular systems, give to the wearied mind a greater elasticity and stimulate it to increased reflection. The increased activity of the heart, (and headache, &c., when taken to excess) are caused by the caffeine, and the increased action of the kidneys, the sudoriparous glands, and the intestines, together with the restlessness and congestion caused by an excess, he ascribes to the volatile oil. These effects were studied by Lehman by analysis of the excretory products of a person in a normal condition, and while under the influence of the above substances, and the conclusion is confirmed by deductions from observations made upon the effect of coffee upon the poorer classes of people whose nourishment is necessarily restricted. Much of the *nutritive* portion of coffee, namely, that contained in the legumine of the berry, is lost by the European method of making coffee, but the caffeine, contains nearly 29 per cent. of nitrogen, and Payen has calculated that a quart of *café au lait*, contains six times more nitrogen than an equal measure of flesh broth. Liebig has called attention to the fact that 140 milligrammes of caffeine correspond to 31 of gall in the form of taurine, and that if a decoction of coffee or tea contains only 0·05 centigrammes of caffeine, it must produce an appreciable effect, if this substance conduces to the formation of bile, which seems probable from its beneficial effect in certain diseases and in treatment for poisonings.

In this country a really good cup of coffee is perhaps rather the exception than the rule, and this may probably be attributable to the nation

* Lehman, † One in 50,000, Johnson.

from which we are in the habit of selecting our cooks, since there is nothing in the whole culinary art which requires more "*sense*" than the preparation of good coffee. One of us has been in the daily habit for several years past, of preparing his own coffee (burning it himself,) and to the other, good coffee is not only a luxury but a necessity; we undertook the following experiments, therefore, with a view to ascertain whether a portable coffee, so simple in its preparation that it could not be spoiled, could not be offered to the public at a price at least as low as that for which the raw or roasted material may be purchased. This was only to be hoped for by extracting from the berry a larger amount of its nutritive substance than is done in the household, and in such proportion as would pay the expense of the operations to which it must be subjected. Our efforts in this respect have been in vain, but we are notwithstanding inclined to publish the experiments for the benefit of those who may wish to pursue the matter further than we did, and we hope with more success.

The coffee used in these experiments was the Mocha, and was taken from a bag which a year's trial had proved to give an infusion of a very delicate and pleasant flavor.

As a preliminary experiment, 65 grammes were exposed to a gradually increasing temperature in a retort in a wax-bath, a thermometer being thrust through the coffee in the retort and another being in the wax. The following are the temperatures at which the distillates where collected.

No. 1. Temperature of the retort 70°—150° C. a slightly acid colorless liquid of the odor of raw coffee.

No. 2.	Temperature of the bath	200°,	of the retort	150°—180°.
No. 3.	"	"	200°	"	180°—200°.
No. 4.	"	"	205°	"	205°.

The heat was kept up for an hour at the temperature of 205°. The distillate became more acid as the temperature increased, and the raw smell diminished, being replaced by a disagreeable empyreumatic odor. The coffee at this stage had lost about 14 per cent. of its weight. No. 2 was rectified at 125°, and gave a colorless liquid with a pure odor of raw coffee. After No. 4, the two thermometers indicated the same temperature and the distillates were removed at 200°—250° and 250°; after which the temperature was raised to 270°, at which it was kept for three hours. All of these distillates had a disagreeable empyreumatic smell, which increased towards the end, a small quantity of caffeine had sublimed into the neck of the retort, and on examining the coffee it was found to be imperfectly roasted, those grains which were next the sides of the retort being quite black. The apparatus had therefore to be modified, but we were able from the experiment to verify the limits of temperature between which coffee is said to be roasted, these are, from 200° to 250°.

A sheet copper cylinder, open at each end, of about 7 inches diameter and 14 inches high, was made; a large circular tube gas-burner fitting the cylinder, was placed at the bottom, and about 3 inches therefrom a diaphragm to equalize the heat. About 3 inches from the top of the cylinder a hole was made of sufficient diameter to admit the neck of a Florence flask; and diametrically opposite, a smaller hole to admit a ¼-inch brass rod, to the end of which was attached, cruciform, two slips of sheet brass bent so as to form a clamp which embraced the bottom of its flask, and

which, owing to the elasticity of the clamp, could be easily inserted and removed. The brass rod, and with it the flask, was rotated by means of a culinary jack which went by clock-work, and announced its running down by a bell sounding a couple of minutes before the event took place. We had thus a perfect roasting apparatus on a small scale; the temperature of the oven indicated by a thermometer, could be kept steady to a degree, and at once rapidly increased or diminished by means of the gas flame and a cover placed in different positions on top of the cylinder; a tube connecting the flask with Liebig's condenser, enabled its volatile products to be collected. The coffee was burned equally in the flask, no matter at what temperature, and was kept from slipping by a piece of iron wire which was sprung into the flask.

We proposed, in experimenting with this apparatus, to roast as much coffee as would make one cup of the infusion, noting the temperature, collecting the volatile products, and comparing the taste of the coffee made from the berry in the flask (at first alone and then with the addition of the volatile products,) with coffee of the same bean, roasted in the usual manner and of the same strength. It will be well in this place to explain the method adopted by us in making a cup of coffee, that comparison may be made with the experiments to follow.

It has been before stated, that one of us (C. M. W.) has been in the habit for some years past of preparing daily, a morning and evening cup of coffee. It was a desideratum to effect this with the least trouble, and before the present method was adopted many different ways were tried; many of the different coffee machines with alcohol and without, were used; coffee was purchased already roasted, some roasted and ground, the different so-called extracts of coffee used, and raw coffee was obtained and roasted in the laboratory by different methods. The following plan was found the most convenient, the coffee tastes always the same and has been approved of by all who have partaken of it.

The Mocha berry is roasted in a cylindrical drum in quantities of seven or eight pounds. This, indeed, is the most important part of the operation, for if a good berry be *properly roasted* and the infusion be of the proper strength, good coffee *must* result. The roasting process will be more fully alluded to subsequently. The above quantity of coffee when roasted is placed in a stone-ware jar the mouth of which is of 3 inches diameter, and which may be closed air-tight, by hammering in a cork with a piece of buckskin or bladder interposed. This quantity of coffee will make two cups daily for five or six months, and no difference can be detected in the taste at the end of that time. The coffee is ground at intervals to fill a wide mouthed glass stoppered bottle holding a quart or enough to make about thirty cups of coffee; the ground coffee is perfectly preserved in this bottle. The best coffee pot was found to be the common biggin, or that having an upper compartment with perforated bottom upon which is placed the coffee. To make a cup of the infusion, a measure of ground coffee holding half an ounce in weight is placed in this upper compartment and a cup full of water (six fluid ounces) is poured into the bottom compartment and the biggin is placed over a gas lamp. In about three minutes the water boils, and when the steam begins to issue from the top of the coffee pot it is taken from the fire, the water poured into the cup

and thence immediately into the top of the biggin, where it extracts the berry by displacement. If the coffee has been ground to the proper size the liquid runs through freely and is perfectly clear, and with *boiled cream* gives a very delicately flavored beverage. It is important to keep the coffee pot perfectly clean, as the least musty smell indicates a disagreeable taste which is imparted to the coffee.

The following experiments were performed in our small Florence flask roasting apparatus. According to Payen, raw coffee roasted to chestnut brown color, loses 20 per cent. of its weight, and to reddish brown 15 per cent. The quantity for one cup of coffee roasted in the flask was 13·2 grammes of the raw berry, which, to lose 20 per cent., would become 10·5 grms., or somewhat less than one-half an ounce on the quantity taken to make the infusion in the usual manner. To lose 15 per cent., the above quantity would become 11·2 grms.

First Experiment.—13·2 raw coffee raised gradually to 220° and kept at that temperature until of a light brown color; at the end of the operation white fumes made their appearance. Weight of the roasted coffee 11·5 or a little over, 15 per cent. loss of weight, is less brittle than it should be. Infusion of good flavor but weak.

Second Experiment.—13·2 raw berries raised at once to 225,° which temperature was maintained for 22 minutes. At this time the fragrant smell of roasted coffee was emitted, the berry was of the right color and brittleness, and weighed 11·5, the same loss of weight as the last. The infusion excellent, and exactly like that prepared by our usual method.

Third Experiment.—13·2 raw coffee heated at once to 225° and kept there for an hour and a half. The coffee had a very dark appearance and the infusion a disagreeable burned taste. Weight of roasted berry 11 grms. corresponding to a loss of 16·7 per cent.

Fourth Experiment.—The same quantity heated for a quarter of an hour at 225°, and then for an hour and a quarter at 200°; coffee dark and the infusion decidedly bad.

Fifth Experiment.—The same quantity kept at 200° for an hour and a half, when the color appeared right; a fragrant smell came over with the distillates unlike the coffee aroma, and the infusion was almost tasteless compared with good coffee. In these experiments, the distillates had a similar smell and taste. At first an odor of raw coffee appeared, which gave way to a empyreumatic liquid of unpleasant taste, and although at the close of the operations in experiment 2, the smell emitted was aromatic the taste of the distillates was disagreeable. In none of the instances did the distillates added to the infusion of the berry, decidedly improve the taste. The experiments show that the loss of weight is no criterion that the coffee has been properly roasted, neither, (considered alone) does the color nor the temperature to which it has been exposed, nor the time which latter must vary in proportion to the weight of coffee. But it follows, that the coffee must be raised at once to 225° and kept there until it has acquired the proper color, and *at once* when the color is reached, and at the same time when breaking a couple of grains show them to be sufficiently brittle, it must be removed from the fire. At the close of the operation, white fumes begin to come over, the peculiar aromatic smell of roasted coffee is emitted, which directs attention

to a particular care to watch the close of the operation. Although 225° is the lowest temperature at which coffee is roasted by our experiment, it does not follow that the temperature of the oven is as low, it should in fact be higher in proportion to the quantity of coffee roasting, in which case, a thorough mixing of the grains is important. By our first experiment with the retort it will be seen, that although the temperature of the oven be constant, that of the coffee rises gradually, which is to be expected.

These experiments were preliminary, our intentions being to ascertain whether the aroma developed by roasting coffee and which is lost, might not be collected and added to the coffee at pleasure, thus increasing its value. In connexion with this, an experiment was performed to ascertain whether the fragrant volatile oils might not be driven from roasted coffee by steam, and a dried extract of the residual coffee made, to which the same oils might be afterwards added, giving a good and portable coffee. To effect this, a pound of the roasted grains was heated in a retort in a water bath, and steam passed over them. The distillate was condensed in a tubulated receiver, the temperature of which was suffered to rise by the operation, from the receiver the vapors passed through a Liebig's condenser into another receiver cooled by salt and ice. The coffee remaining in the retort gave an inferior infusion resembling coffee in taste, and which was somewhat improved by the addition of the liquid in the receiver cooled by salt and ice. The distillate in the first receiver was acid, and curdled the milk when added to the coffee.

(To be Continued.)

For the Journal of the Franklin Institute.

On the cause of Distortions in Photographic Pictures.—A Disclaimer.

By J. F. Mascher.

To the Committee on Publications.

Through the politeness of Dr. W. H. Pile and George W. Smith, both of this City, I have had pointed out to me an article on page 291, Vol. xv, *Sillimans Journal*, for 1853, from Sir David Brewster, on photographic pictures taken with different sized lenses, in which that gentleman points out the true cause of the distortions noticeable in pictures taken with lenses larger than the human eyes; and as I have no desire of appropriating to myself the laurels of others, I cheerfully disclaim so much of my article, on page 345 of your *Journal* for May, as relates to the distortions of pictures, and I can assure you that it affords me much pleasure to make this disclaimer, inasmuch, as that article being from the highest authority of the present age, corroborates the truthfulness of my deductions, not only in respect to the distortions of pictures, but also, indirectly, the balance of my article on page 344 of your *Journal*. I say, corroborates, because it will be self-evident to any one reading the article of Sir David Brewster, that he arrived at precisely the same conclusions in this respect, with myself, although starting from entirely different premises.

It has long ago been noticed by artists, that pictures taken through

small diaphragms, were "sharper" than those taken through large lenses without a diaphragm, but who ever pointed out the true cause, before Sir David Brewster did, two years ago, and the additional facts (independent of the stereoscopic angles, &c.,) contained in my article alluded to? The fact has always been explained to me, by artists, upon the principle of a profusion of light—somewhat similar to what takes place when looking at objects through a microscope in which the light is admitted through a large aperture or diaphragm, but it will be seen from the articles alluded to, that this explanation is not correct.

In conclusion, I would earnestly recommend all those interested, to give the article of Sir David Brewster a careful perusal, assuring them that they will be amply rewarded for their time.

Philadelphia, June 25th, 1855.

---

*Modern Rail Bar Rolling.**

The Rhymney Iron Works Company has just rolled the largest railway bar ever produced. It is one of Barlow's patent rails, and has been sent to the Paris Exhibition. Previous to the appearance of this example of such rolling, a 22-feet rail was the ultimatum, but the Rhymney Company has gone, at one stride, to a length of 52 feet 6 inches. Mr. G. P. Hubbuck, the managing engineer of the works, conducted the operation, and he has made such excellent work in the present instance, that the rail has not been painted. It is simply brushed over with oil to repel the attacks of rust, and in this condition it will make its appearance in the great show of France.

For the Journal of the Franklin Institute.

Steamboat Metropolis.

Hull built by Samuel Sneden & Whitlock, Green Point, New York; Engine by Stillman, Allen & Co.; Erastus W. Smith, Engineer.

HULL.—

Length on deck,		342 feet.	
" of keel, half scarf,		325 "	
Breadth of beam,		45 "	
" " moulded,		44 "	5 inches.
" " over all,		81 "	2 "
Depth of hold,		16 "	
Length of engine space,		60 "	
Draft of water,		10 "	6 "
Tonnage, (Custom-house,)	2108.		
Contents of coal bunkers, in tons,	50.		

Average speed through the water per hour, 17·8 miles.

ENGINE.—One—vertical beam.—

Diameter of cylinder,		105¼ inches	
Length of stroke,		12 feet.	
Average pressure of steam in pounds,	24.		
" cut-off from commencement of stroke,		4 "	6 "
" revolutions per minute,	15½.		

* From the London Mechanics' Journal, April, 1855.

BOILERS.—Four on guards, 2 on either side, back to back, with vertical tubes of brass.

Length of boilers,		20 feet	8 inches.
Breadth "	aft, 13 feet 3 in. forward,	11 "	3 "
Height "	exclusive of steam chimney—aft,	13 "	3 "
" "	" " forward,	11 "	3 "
"	steam chimneys, aft, 7 feet—forward,	8 "	
Number of furnaces in each boiler,		2.	
Breadth of furnaces,	forward, 4 feet 9 ins. aft,	5 "	9 "
Shell back of furnace, cylindrical.			
Length of grates,		7 "	
Internal diameter of tubes,			2½ "
Heating surface in the 4 boilers, 12,000 sq. ft.			
Diameter of smoke chimney,		6 "	
" " "	above grate,	62 "	
Description of coal,	Anthracite.		
Draft, natural, with fan blower under grates part of the time.			

PADDLE WHEELS.—Iron.

Diameter,	41 feet.	
" over paddles,	40 "	
Length of blades,	13 "	
Depth "		30 inches.
Dip of wheels, average load,	5 "	

Floor timbers and frames double; molded at keel, 20 inches; sided, 20 inches; at tops, molded 8 inches; sided 16 inches; distance between centres 24 inches. Frames of white oak, live oak, and locust; top timbers locust and cedar.

Bottom, keelsoned with 7 tiers, of white oak; centre keelson, 4 feet deep; side keelsons, 3 feet deep; keel molded 14 inches; sided 16 inches. Paddle wheel beams, of white oak, 20 inches square.

Single top timbers, molded, 8 inches, sided, 8 inches, extended to state room deck; 10 feet above main deck and 26 feet above floor; capped with a white oak clamp timber 13 inches square, extending from end to end of boat. Frame strapped diagonally with iron bars $4\frac{3}{4} \times \frac{3}{4}$ inches, one bar to each frame, extending from below the turn of the bilge to the clamp timber capping top timbers.

One half the bars are countersunk flush into frames, the remainder are cross-laid over them at angles of 90°, and the ceiling, bilge keelsons, and clamps scribed over the latter. The bars are riveted at their crossings between the frames and each bar bolted to every frame it crosses, which, together with their being accurately imbedded in the wood, gives the structure great strength and stiffness.

Remarks.—The *Metropolis* is believed to be the largest *steamboat* afloat, and the first that has been constructed with the diagonal iron truss work extending to the state room deck, which adds, probably, 200 per cent. to the longitudinal strength of the hull after cutting out sufficient spaces for the freight, passenger, and fire room gangways, making the usual unsightly timber "hog frames" in general use on large steamboats, unnecessary.

To Mr. Sneden, belongs the credit of introducing this new and important addition of the truss work in the construction of steamboats. The model and execution of work is likewise highly creditable, and will add new laurels to his established reputation.

To engineers and others capable of giving correct judgment, the engine will speak for itself. It will bear comparison with the best spe-

cimens of engine work to be found in this country or Europe. Notwithstanding its immense size, the steam chests, side pipes, throttle valve pipe, and entire front of engine, is turned planed and polished in the highest style of the art, and the entire machine exhibits a perfection of execution of which Stillman, Allen & Co., may justly be proud.

The valves, which are of the usual balance description, are fitted with Allen's & Wells' adjustable cut-off, which can be conveniently changed while the engine is in motion to suit the varying requirements of speed or economy. By a peculiar arrangement of the hand gear, the engine is easily worked by hand ahead or back by one man. The engine room is fitted with magnificent and reliable instruments for denoting to the engineer the pressure of steam, condition of the vacuum, temperature of water in the condenser, the rotation and position of the cranks at all times, an engine counter that will exhibit in one row of figures the number of revolutions performed in a minute, passage or year; an indicator operated by the pressure within the cylinder illustrating the internal performance of the piston and valves and degree of expansion; and lastly, a rich patent lever clock with 25 inch dial of silver.

The cylinder is more than one-third larger than that of any other single marine engine in the world, being $1\frac{3}{4}$-inches larger diameter and 3 feet more stroke than any one of the cylinders of the English steamship *Arabia*, which is $103\frac{1}{2}$ inches diameter and a stroke of 9 feet, the next largest marine cylinder in existence. The extraordinary capacity of the *Metropolis*' cylinder will, perhaps, be best appreciated when it is known that 22 invited guests found comfortable seats at a table and dejeuner served by Stillman, Allen & Co., within its iron walls. After the table was removed, a horse and top carriage was driven through by Col. Borden and others, the top standing. 103 men then found room to stand erect within the bore of the cylinder.

One of the sticks of yellow pine timber employed in the construction of the gallows frame was 81 feet long, squared 2 feet 10 inches, and contained over 500 cubic feet, the largest ever brought to this market.

The boilers, in general principles, are the same as those introduced with so much success by Mr. Collins on his famous steamships. The shape of boiler and internal arrangement is different, affording simplicity of construction and unequalled facility for cleaning and repairing every part.

The engine is fitted with a self-operating stopping apparatus, arranged by Mr. Smith especially for this boat. It will instantly unhook the eccentric and shut the steam off of the cylinder, the moment when by breakage of any of the parts the cross-head travels $\frac{1}{2}$-inch beyond the stroke prescribed by the cranks. This is believed to be the first application of such an appendage, the importance of which all engineers will appreciate.

The performance of the *Metropolis* more than equals the most sanguine expectations. Her average speed is one and a half miles per hour faster than the average of the *Bay* and *Empire State*, the sister steamers of the same line, and her consumption of coal is only the same as theirs. The *Bay* and *Empire State* are each 317 feet long on deck; 40 feet beam, and draw with average load, 9 feet 9 inches; each having an engine of 76 inch cylinder, 12 feet stroke, with two flue boilers of the usual de-

scription, using fan blast under grates and working a steam pressure varying from 30 to 45 lbs. to the square inch, according to circumstances, and cutting off at ½ and ⅝ths of the stroke, the cut-off being unadjustable when the engine is in motion. Wheels, 38 feet diameter.

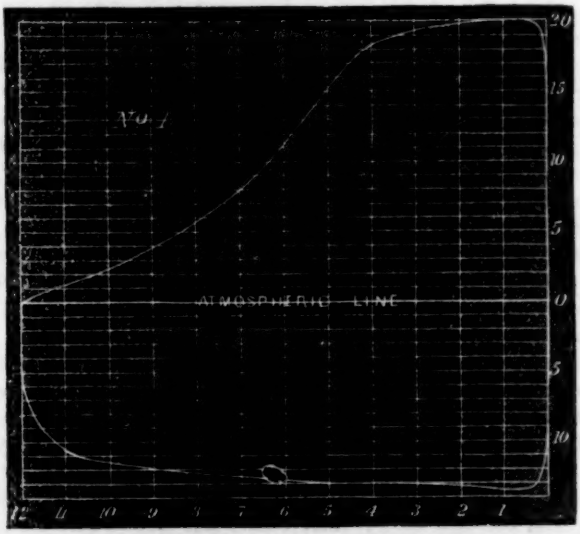
The distance between New York and Fall River is 178 miles. The average running time of the *Bay* and *Empire State* is 11 hours, consuming on an average 88,000 lbs. of coal. The average running time of the *Metropolis* is 10 hours, making the first half of the passage with natural draft only, with a steam pressure of 20 to 24 lbs. cutting off from 4 to 4½ feet of the stroke, and consuming about the same amount 88,000 lbs. of coal. She will make the passage in 11 hours with natural draft the entire passage, and consume only 68,000 lbs. Her best speed is not yet known, as she has never been driven up to her maximum performance. On Saturday, June 9th, she performed the passage from New York to Fall River in 8 hours 51 minutes running time, much the shortest passage on record. The hulls are all from the same builder, and the difference between the models and angle of entrance is immaterial, the only difference being in the *Metropolis* having a little more fullness at the ends and less at the bilges; she being 25 ft. longer, 5 ft. more beam, 550 tons greater burden and drawing with average load 9 inches more water than the above named boats, makes the coal she consumes when performing equal speed, less than two-thirds the proportionate amount. This result is due, no doubt, to the arrangement of the boilers, affording comparitively, a larger amount of fire and grate surface in a condensed form, with less proportionate weight, and ample tubular fire surface of little thickness of metal compared to the plates of flue iron employed in the construction of the ordinary flue boilers, combined with a cylinder of large capacity, fitted with adjustable expansion gear, and every other approved appliance for getting the most useful effect out of the steam while passing through the cylinder before it is ejected into the condenser.

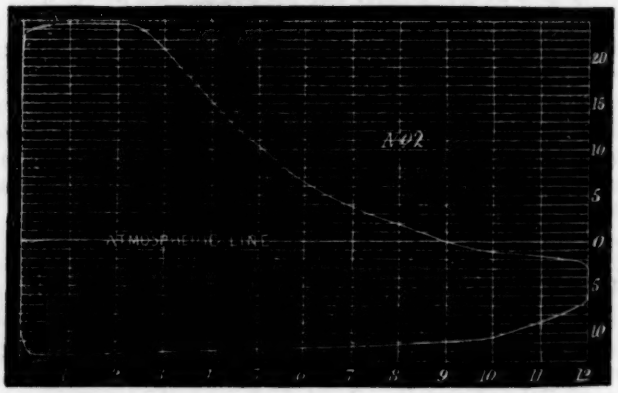
The large area of the cylinder affords the requisite power with the low steam pressure of 20 to 25 lbs. to the square inch, cut off at ⅓d or ⅖ths of the stroke, which becomes expanded to a pressure *below* that of the atmosphere before the end of the stroke, as illustrated by the annexed indicator diagrams; while in the other boats, using the customary small proportion of cylinder to boat, and making up for the want of capacity of cylinder by employing steam of high pressure, cutting off in many instances beyond half stroke, the steam exhausted into condenser at the end of the stroke is 10 to 15 lbs. *above* the atmosphere.

The engine of the *Metropolis* is adapted when working up to full power to steam of only 25 lbs., and as cutting off at from ⅓d to ⅔ths of the stroke has been found in practice to produce the best results commercially, which is, the best balance of forces and expenses considering the weight and cost of engine, and required quantum of fuel to give the best speed after leaving appropiate carrying capacity for freight and passengers; 25 lbs. seems to be about the best working pressure for condensing boat engines where the engine and boilers have been adapted to it: and moreover, the surface, of boilers, steam pipes and cylinder, will radiate much less caloric at the temperature due to 25 of steam, than will be lost at a temperature due to 45. For stationary engines

where the weight is no objection, and the boilers and other radiating surfaces can be thoroughly protected with brick work, steam jackets, &c., a higher initial pressure of steam, and greater degree of expansion is desirable, and will be attended with proportionate economy.

The indicator diagrams below, will illustrate the degree and outline of expansion in the *Metropolis* cylinder; No. 1, being from the bottom, cutting-off at 4 feet, and making 15½ revolutions per minute; No. 2, form the top, cutting-off at 3 feet and making 15 revolutions. Expanding the steam to below the pressure of atmosphere.





No. 1		No. 2	
Revolutions,	15½	Revolutions,	15
Pressure of steam,	22½ lbs.	Pressure of steam,	24 lbs.
Vacuum per gauge,	25½ inches.	Vacuum per gauge,	25½ inch.
Temperature of hot well,	125° Fah.	Temperature of hot well,	118° Fah.
Throttle valve	open.	Throttle valve	open.

The cabin arrangements differ from those of any other steamer in our waters. In the body of the boat below main deck, there are 304 berths in tiers of four on either side, in one unbroken range, of about 275 feet. In the ladies' saloon there are 96 berths, in four tiers of three, one tier on either side and two in the centre of the saloon, back to back; the great beam of boat admitting of this arrangement, which, without crowding, adds 100 per cent. to the berth capacity of the saloon.

On the state room deck there are 94 single and double rooms, 13 being furnished with double bedsteads, with gorgeous furniture and drapery that cannot fail to please the most fastidious bridal parties. The state rooms forward and aft the engine, are ranged in pairs athwartship, on either side of the boat, and connected by a central door which admits of two rooms being converted into one when found agreeable by families or friends. The rooms are entered from the state room saloon by an alcove which communicates with the doors of two pairs of rooms, and which admits of the light for each room being inserted in a pocket or lantern by the servant from the outside, thus greatly reducing the liability of fire from lights in the hands of the passengers. A toilet room and retiring apartments on the state room deck is a new and very convenient provision for the lady passengers on that deck. There are also gentlemen's retiring apartments on the opposite side of the saloon. The state room deck is extended to the stem, covering the entire main deck, which is enclosed by bulwarks. The furniture of the state room and ladies' saloons is rosewood, upholstered with moket of various and elegant patterns; the carpets are double velvet tapestry. The appointments throughout, are both comfortable and luxurious.

The *Metropolis* is provided with two of Worthington's steam fire engines, each capable of throwing three efficient fire jets; and has, besides, two hand fire engines, and a means of converting the boiler force pumps into fire pumps; and an ample provision of fire hose, buckets, and axes, and carries eight life boats and 1000 life preservers.

The traveling public are indebted to Colonel Richard Borden, President of the Bay State Steam Boat Company, for this gigantic and efficient addition to the steam palaces for which this country is deservedly celebrated. He had, besides the enterprise and liberality necessary to produce such a structure, what is *equally* necessary to prodcce the highest result in any undertaking, confidence in the principal mechanicians he had employed; and after giving their plans due consideration, invariably gave them his confidence and patronage.

The *Metropolis* is under the command of Captain William Brown, and runs between New York, Newport, and Fall River, on the Boston route, in connexion with the steamers *Bay* and *Empire State*. E. W. S.

---

*Permanent Impressions of Flowers on Glass.**

Mr. Robert Smith, of Blackford, who has often contributed to our pages, has contrived a very ingenious and effective plan of ornamenting glass, by producing thereon, permanent impressions of flowers, leaves of plants, and other objects. In this process of ornamentation, the operator

* From the Lond. Pract. Mech. Journ., April, 1855.